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Europe/Latin America Report

SCIENCE AND TECHNOLOGY

SPECIAL NOTICE INSIDE

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EUROPE/LATIN AMERICA REPORT

SCIENCE AND TECHNOLOGY

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FRANCE'S RHONE-POULENC DEVELOPING CERAMICS

Paris L'USINE NOUVELLE (PRODUIRE supplement to No 51) in French 18 Dec 86 p 15

[Article by Philippe Lanone: "Pierre Deny: Rhone-Poulenc's 'Homo Ceramicus'"]

[Excerpts] Set up an ultramodern industrial ceramics plant in less than 1 year and put Rhone-Poulenc in the leading position worldwide in this field: This is what Pierre Deny and his team accomplished in Bazet, near Tarbes.

Indeed, his career is unusual. After 3 years in the video field, he joined Renault where he first worked in data processing. Together with Michel Pham Hu Tri (now in charge of ceramic powders at Rhone-Poulenc) he then assumed responsibility for the group's diversification studies: liquid-crystal displays, ceramics, etc. In this context he negotiated the purchase of the thermomechanical ceramics division of Ceraver.

Renault's decision to suspend diversification placed everything in doubt. Pierre Deny had to find a company to get busy again. It was to be Rhone-Poulenc, which was buying mainly brain power: some 50 R&D people. An industrial facility remained to be built. This was the task of Pierre Deny, who became general manager of Ceramiques et Composites (C&C), the company created for the production of parts.

Rhone-Poulenc put its money where its mouth was by allocating Fr 100 million in capital! From the beginning C&C was able to procure the most modern equipment: Coudamy kiln, isostatic 2,000-bar press custom-made by ACB, etc. Pierre Deny's intention: "To oversee all the processing technologies currently being developed, but with industrial resources. The Japanese have extraordinary achievements, but they are laboratory curiosities. We prefer to invest in the development of industrial processes."

As a specific example on the technical level, C&C has registered a very promising patent for a parts manufacturing process by injection welding, which even the Japanese would like to buy. Pierre Deny's goals: Reach sales of Fr 100 million in 1990 and increase staff from 60 to 100 persons within 2 or 3 years.

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U.S. SPACE STATION TALKS AFFECT HERMES, COLUMBUS DECISIONS

Stuttgart FLUG REVUE in German Mar 87 p 24

[Article by Goetz Wange: "Europeans in a Dilemma"]

[Text] The European space travel managers face difficult problems. Not only the wishes of the US military but also their own transport systems cause worry.

In the summer, the European space agency ESA wants to set its switches for the next millennium: At the ministerial level, the construction of the large rocket Ariane 5, its most important payload--the space glider Hermes--and Columbus, the European part of the American space station all are to be given the green light. But the date is becoming more and more questionable the more closely it approaches. Unofficially there already is talk of a shift to the fall if not to the next year.

First of all there are the negotiations with the Americans. Not much is left over of the formerly so affable gesture of the President of the US, who had invited Japan, Europe, and Canada as equal partners in participating in an international space station. Provisional summary of the European negotiation managers: "The Americans see only their own interests." This holds true not only for the question of the experimental areas.

The negotiations also have gotten stuck on how a decision is to be made in case there are differences of opinion among the partners of the space station. The American position: A consensus will be sought in every case; if this cannot be achieved, we will decide. The European position: The directives must be set down in advance. Up in space we need a commander, and he should be an American. But in the European Columbus part we have the exclusive say-so--naturally on the basis of previously specified agreements.

Concept Changes Are Expensive

The German general director of the European space organization ESA, Professor Reimar Luest, believes that the NASA chief James Fletcher is becoming more understanding of the European positions: During discussions in December we made good progress. The argumentation is no longer on a take-it or leave-it basis, but we are now trying to approach and to solve problem after problem."

Luest could even make clear to his opposite that the constant changes in the basic technical concept of the space station, without any consultation with the partners, were no longer acceptable. The European development teams for the Columbus parts essentially had to start all over again every time. Luest recalled the experience with space lab: "At that time the interface was not regulated. For the space station, we made it clear to the Americans: We need minority protection, a procedure that regulates who bears the costs for changes."

The discussions between NASA and ESA are made more difficult by the interjection of the US military. Originally they had no interest in using the space station but now they are making claims. "We really still don't know exactly what the space station is supposed to be used for, but we desire a policy which makes access to the station possible for us." This is the position from the team of consultants from the US Secretary of Defense Caspar Weinberger. Experiments for the SDI Program are considered probable. The next round of discussions between ESA and NASA were set for January but has been shifted to the end of February. The Europeans are in a tricky position because, within the framework of ESA, they have obliged themselves exclusively to the peaceful use of space travel. Luest makes clear: "The use of space weapons or other applications which can be recognized as being clearly military must remain excluded from the space station."

He has no objections against research whose subsequent application can be both civil and military, even if the financing comes from the American defense budget. A compromise is delineating itself.

The "European Autonomy" card now can be played only to a limited extent. What cannot be foreseen are the technical problems, which the French are already having in the current preparatory phase for the manned space glider Hermes. Strong doubts are appropriate, whether the project will be mature enough for a decision at the time of the planned ESA minister's conference in the summer. A vote for the heavy payload carrier Ariane 5 also is not reasonable apart from this. And whether planning or even operating costs for participating in the space station will come into view more clearly by that time than is the case today, must likewise be doubted.

The Europeans have a dilemma, because time pressure has never yet produced good solutions.

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CSO:3698/344

BRIEFS

ARIANE RESUMES IGNITER TESTING--Tests on the third-stage motor of the Ariane rocket, which were interrupted for the holidays, resumed on 7 January and will continue for the next 3 months, we learned from Arianespace. Seventeen different tests must still be completed before the 19th launch in April. The first 1987 test made on this motor--the cause of the launch failure of 31 May 1986, took place on 7 January; it was an adjustment test of the third-stage motor that will be used on flight V-19 of the Ariane rocket. Once these tests are completed, the third-stage motor will be certificated for the launch. At the same time, the motor manufacturer, i.e. SEP, and Arianespace have undertaken the preparation of the 20th-launch motor. Since the stinging and costly failure of 31 May 1986, experts from the two companies and from ESA have ordered multiple tests to ensure that satellite launches can be resumed as soon as possible and with all possible assurances to satellite owners. Between the failure of the 18th launch and the V-19 flight, people at Arianespace point out, a total of 49 different tests will be carried out. From 2 August to 22 December, 32 tests were carried out, SEP indicated. There were five adjustment and reference tests on the former igniter of this complex motor, which burns liquid oxygen and hydrogen; three other tests involved a reduction of the motor-chamber cooling using the former igniter. These were designed to identify the true causes of the V-18 failure. Later on, 21 additional tests were made on two new types of igniter. Five used a 3-jet igniter and the 16 other the 2-jet igniter eventually selected by the international experts of the investigation commission. The remaining three were miscellaneous tests. Before the V-19 launch, SEP indicated, acceptance tests on the motors to be used for the V-19 and V-20 flights and safety margin demonstration tests will take place. The clientele's confidence in the Ariane family of launchers was not affected in spite of the long interruption in the launching of commercial satellites that followed the failure of 31 May, and new contracts and launch reservations are expected to be announced soon. [Text] [Paris AFP SCIENCES in French 15 Jan 87 p 10] 9294

SWEDISH FIRMS IN ESA--An agreement has been reached between the Swedish government and the three companies Volvo Flygmotor, Saab Space, and Ericsson Radio Systems. The agreement means that a total of 100 million kronor will be allocated so that the Swedish companies can participate in projects conducted by ESA, the European Space Agency. Of the 100 million, the government will provide 40 million kronor and the three companies together will invest 60 million kronor. [Text] [Stockholm DAGENS NYHETER in Swedish 28 Feb 87 p 14] 9336

CSO: 3698/317

MONOCLONAL ANTIBODY PRODUCTION FACILITIES SURVEYED

Paris EUROPEAN BIOTECHNOLOGY NEWSLETTER in English 11 Mar 87 pp 6-7

[Text]

Many firms and public organisations produce mabs for their own purposes, and quantities produced increase every year, testifying to the expansion of mabs fields of application, in particular in diagnosis. Customers can subcontract large-scale production of the mabs they need. Production in animals has been the rule since recently. Charles River (2) are the leader in this type of technology.

Nevertheless, there is a general trend towards increased purity requirements, reinforced by promising therapeutical uses (see EBN 2014). Thus many diagnostic firms have switched to fermenters. Obviously, large pharmaceutical concerns like Sandoz, Rhône-Poulenc or Hoffmann-La Roche are drastically improving their in-house production capacities, preparing themselves to produce large quantities of high-grade mabs. On the other hand Celltech are well-known for offering mab production under contract (1).But there should be a place for others in this huge market, even for small firms with much smaller production capacities and R&D potential. The following firms offer contract production:

Austria - The University of Agriculture (3) can produce mabs in their 100 litre fermenter but private firms involved in mab production, including Immuno AG, Bender AG and Biochemie AG, do not work on contract basis.

Denmark - Novo is the only firm offering contract production (4). So far, they have supplied only their affiliated pharmaceutical subsidiaries, but the possibility of offering a service to outside customers is being considered.

Federal Republic of Germany - Bissendorf Peptides (5) offer contract production. InVitron Corporation (USA, (6)) are going to set up a large facility in Hanover, with the aim to produce 100-200 kg/year. The firm is specialised in contract production of mammalian cell products. Mabs from hybridoma cells have accounted for the major part of InVitron's work so far. GBF (7) have excellent skills, but are lacking sufficient equipment, thus supplying only university requirements. But a larger production plant should be available within 6-12 months.

France - Immunotech (8) offer mab production both in fermenter and animals, including therapeutical grade mabs. Moreover, a unit for mass cell culture has been created at Institut Pasteur (9) last October, with the aim to optimising production and purification processes.

Israel - Interpharm (10) are the major medium-to- large scale mab manufacturer. Other firms produce small quantities of antibodies for their own diagnostic needs (see Special Report 18).

Netherlands - Recently set up (see EBN 0603), Euroclone (11) offer medium-scale production and expertise in this field. BioIntermediair (12) also offer mab production in their continous hollow-fibre perfusion system, in particular for mouse/rat hybrids and double strain mabs.

Sweden - Bioinvent (13) offer medium-scale (5-200g) production in their perfusion system. Grades up to phase II clinical therapeutical application standards are available. Processes for human mab production are being studied. Monocarb (14), a subsidiary of BioCarb provide large-scale production of mabs. A new operation with a 4000 litre/year production capacity is due to start functioning soon. Product capacity is now 30 000 litre/year.

United Kingdom - Contract production world leader Celltech will supply Ortho Diagnostics with multikilograms of mabs, and Hybritech with over 1 kilogram. Celltech manufactured the first mab to be marketed in Europe as an injectable product. It is worth noting that Celltech are doing a major thrust into pharmaceuticals, so as to benefit from vertical integration. Major monoclonal producers look in the same direction as diagnostic concerns...Bioscot (15) are expanding their production capacity up to tens of grams (see EBN 2005), although contract production is not a major goal.

Special Report - continued -

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SWEDEN: BIOTECHNOLOGY CENTER FULLY FUNCTIONAL IN TWO YEARS

Stockholm SVENSKA DAGBLADET in Swedish 19 Feb 87 p 14

[Article by Ingrid Eriksson]

[Text] In just under 2 years the new center for life sciences will be completed at Huddinge Hospital. Better diagnostic methods and new and better pharmaceuticals and vaccines are some of the results that are expected from this research.

"Gene technology is the main thrust of this medical research," said Professor Jan-Ake Gustafsson, executive vice president of the Center for Biotechnology. A center at which basic research and clinical research cooperate with corporations will give new impetus to this research.

These developments at Huddinge Hospital have raised some great expectations. The biotechnology center is seen as the motor that will get all of Sodertorn moving. A research city for advanced scientific work is one of the cornerstones of the new Sodertorn. There are also plans for a university, an airport, a train station, and new residential areas.

From Karolinska

Two parts of the planned center for life sciences are already in place. About 40 people are working at the biotechnology center at Huddinge Hospital. Work has also begun at the Center for Dental Technology and Biomaterials. Jan-Ake Gustafsson hopes there will be other centers at the research city, as well.

"The Institute for Medical Technology will be moved here from Karolinska Hospital," Jan-Ake Gustafsson said. As early as April the totally new Institute for Molecular Biology will open, under the leadership of Professor Henrik Garoff from Heidelberg, who has been appointed head of the institute.

Today this research is being conducted in far too confining quarters at Huddinge Hospital. A new building to be constructed right beside the hospital is now being planned. According to plans, construction will begin this fall and the building will be completed in 1 year.

Novum New Name

The center for life sciences will be located in the new facilities of 60,000 square meters. At the same time, the center will be given a new, more international name. It will probably be called Novum.

"Researchers must cooperate if Sweden is to maintain its position in the international completition," Jan-Ake Gustafsson said. "The lone-wolf researcher will be ineffective. Instead, we must develop a team spirit where we concentrate on producing results."

If we tear down the barriers between various faculties and institutes, we will create a climate in which ideas can be nourished and research can take a giant step forward, according to Jan-Ake Gustafsson. This is something that commercial research has already learned. Now, academic research must come together in larger units in order to complete.

According to Jan-Ake Gustafsson, there are several interrelated reasons why we are investing in biotechnology right now. One reason is that our regional development policy calls for the development of Sodertorn. This development includes research and possibly a university, resulting in a kind of intellectual face-lift.

"In addition, researchers here at Huddinge Hospital have been trying to build up independent activities here. In order to conduct meaningful basic research, researchers need daily contact with clinical activities. This results in a mutual exchange of ideas and experience, which is useful to both research and healthcare."

The Huddinge project will derive its special character from its cooperation with industry.

"The companies could commission the researchers to carry out certain assignments," Jan-Ake Gustafsson said. "In exchange, the technology center could train doctoral candidates for the companies."

Not Always Kosher

Several companies have already shown interest in cooperating with the biotechnology center. An American gene technology company has decided to participate.

"Cooperation between researchers and corporations has not always been considered kosher, neither in the United States nor in Sweden," Jan-Ake Gustafsson said. "But now researchers are beginning to see that cooperation can be necessary, especially considering the harsh economic climate."

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RHONE-POULENC MANAGERS ON FIRM'S BIOTECHNOLOGY R&D IN MEDICINE

Paris BIOFUTUR in French Feb 87 pp 35-37

[Interview with Rhone-Poulenc Sante assistant general director, Francois Guinot and human pharmacy research director, Pierre-Etienne Bost, by Jean Cost, in October, 1986, in French, date and place not given]

[Excerpts] Rhone-Poulenc Sante laid the first stone of its Biotechnology Institute, which will be built in the Vitry-sur-Seine Center, on Monday, 27 October, 1986. Following the ceremony, Biofutur interviewed Francois Guinot, Rhone-Poulenc Sante's assistant general director, and Pierre-Etienne Bost, the company's "human pharmacy" research director. We asked them two questions: one concerning the organization of research on human medications and the other concerning the contribution of biotechnologies to that research.

[Question] At what point are you in reorganizing Rhone-Poulenc Sante's research on human medications?

[Answer] At the present time, the human pharmacy has a research staff of approximately 1,700 people distributed among the Vitry, Croix-de-Berny, Gennevilliers, Villeneuve-la-Garenne, Alfortville, Joinville and Mons Centers and the May & Baker Center at Dagenham in Great Britain. When you add the researchers at the Merieux Institute Center in Marcy-l'Etoile and all the development teams dispersed among more than twenty countries, you have a total of 2,600 people in R&D. In 1983, a research and development structure organized by program and project was implemented. In 1985, a "Research Plan" was drawn up: we defined the broad outlines of our research according to specific approaches, taking into account the therapeutic directions in which we would like to develop for the year 2000 (cardiovascular, psychotropics, antimicrobials, analgesics, osteoarticular area, anticancer, antiparasitics and immunomodulators). Naturally, we also included research of the Merieux Institute (vaccines, serums and blood derivatives) and Pasteur Vaccine in the Group. The plan projects investments of 700 million for the 1985-1989 period and relocation of activities in 1989 to the two main French sites, Vitry and Croix-de-Berny and to the Dagenham Center, which will be modernized. The will be little change in personnel during this period; however, a significant improvement in personnel qualifications, entailing 700 geographical and technical transfers and including recruitment of 250 people, is planned. The plan projects a modification in the importance of biotechnological research, which is expected to increase from 11 to 14 percent, and development

Reflection on the strategy of research goals and methods was combined with reflection on the evolution of disciplines and professions within this field of research. Indeed, we are witnessing a massive penetration of molecular graphism in the field of chemistry, of recepterology and molecular biology in the field of pharmacology and, in general, the penetration of new biotechnological methods in the fields of toxicology and cellular and molecular biology. Our organization plans a research program with project directors who are generally biologists, and a distribution of disciplines among specialities that include toxicology, biology-pharmacology, organic chemistry, analytical chemistry and processes and biotechnologies. To this, of course, must be added what we call biopharmacy (galenicals, pharmacodynamics, etc.) as well as the necessary provisions for general administration and management. Rhone-Poulenc sante's research is organized around matrices, which are governed by the larger disciplines, and carried out or applied through programs and projects, in other words, by small groups of researchers who share common objectives. The Biotechnology Institute is one of the broader disciplines integrated into Rhone-Poulenc Sante's overall research program. This overall program is intended to be a versatile and powerful tool. An overall program that was too small would be incapable of going the distance from the discovery, through the development, to the final adjustment of a new medication, and would be unable to promote good "relay work" among all the disciplines involved. We should take advantage of the power inherent in a large group by virtue of its resources and budget, while at the same time stimulating small, innovative groups within it.

One of our greatest concerns is finding the best balance among chemistry, toxicology and pharmacology, understood in its broadest sense. It is fair to say that the three-cornered foundation of our research today is chemistry, biology and data-processing (or computerization). However, another very fundamental aspect of our research is our conviction of the indispensibility of having access to a large enough number of molecules to produce a major innovation at the end of the course.

The "Law of 200 Families" (see box) demonstrates that a company capable of conceiving 200 new families a year has a statistical chance of producing a new medication each year; a company able to conceive 50 new families a year, can produce a new medication every four years. The great majority of these molecular families are chemically synthesized, but a significant fraction are composed of natural substances (originating from plants or fermentation processes). We are, in fact, maintaining research on the metabolic by-products of fermentation, although we have discontinued research using classic antibiotic and antifungal screening. The fermentation or plant-extracted substances that we isolate may constitute quite varied pharmacological leads that may result in new, pharmacologically interesting molecules through total or hemisynthesis. The explosion of biotechnologies in the field of new medications research has not modified our conception of research which is aimed at producing a certain number of new molecules, except in the case of tPA, for which Rhone-Poulenc has a research program.

[Question] What, then, do biotechnologies contribute and how do you use them in your research?

[Answer] Biotechnologies provide new processes, new products and, above all, new biological systems.

The last point is the most important: it is biotechnology's new conceptual contribution to research. In fact, it consists of the support of molecular biology to different research studies in toxicology, pharmacology, etc. In the past, biological targets were revealed by products that were available to us. What is novel is that biotechnologies allow new targets to be uncovered, specifically, by making it possible to have access to previously inaccessible endogenic factors. This of course leads to new ways of researching new products.

With respect to toxicology, there is reason to hope that biotechnologies will increase the productivity of our research. It is estimated that over two-thirds of our promising pharmacological leads (see box) are abandoned because of toxicological phenomena that go unperceived until an advanced stage of research. It is possible to hope that biotechnologies, by allowing access to human endogenic factors (rather than only animal, i.e. poor predictibility of animal toxicology tests) will establish alternative toxicological tests able to be used very early on in the research.

The Vitry Biotechnology Institute (IBV), for which we just laid the first stone, will be completed in mid-1988. At that time, it will be made up of 220 people, including 210 very qualified researchers, and will have a budget accounting for 14 percent of our total research effort. Cost of investment will come to 200 million francs.

The techniques brought together under its roof will include the following: those related to cellular biology, the biochemistry of macromolecules, the biochemistry of metabolic by-products, genetic engineering and research of biochemical processes. To these will be added a pilot and the resources necessary to study extraction techniques.

The 220 persons assigned to this center will be composed of already existing staff from Rhone-Poulenc Sante's French centers and twenty or so highly qualified scientists who will be hired. The current team is functioning as a sort of center without walls, until they can be brought together in 1988.

One last remark: the Biotechnology Institute is a collection of very advanced disciplines. It will be very open to all programs and projects related to any of Rhone-Poulenc's activities, but it will also be open to the outside world.

Most notably, it will work in association with "Rhone-Poulenc Research Center" (Maryland, United States), which has proven competence in the area of bio-conversions (immobilized enzymes) and, from time to time, with other biotechnology companies (Transgene, Cetus . . .). It will also pursue or undertake collaborative efforts with renowned university teams.

Through the quality of its researchers and its considerable resources, IBV will be the instrument allowing Rhone-Poulenc to consolidate and improve its already eminent position within the highly competitive and continuously changing world of biotechnology.

[Box, p 36]

Francois Guinot has expressed some characteristics of human medications research in a law dubbed "200 families", which he formulated based on 15 years of experience, statistical data and after obtaining the reaction of colleagues from other multinationals. To produce a new medication representing a major innovation of international interest requires having had access to some 200 product families approximately 12 years earlier. It involves preparing and testing between 2,000 and 8,000 molecules. Rhone-Poulenc Sante's human medications research staff is capable of preparing about 2,000 molecules a year. Francois Guinot draws a major conclusion for research productivity from the data on which the law is based: "one of the essential factors in the large numbers entailed in the research process is the toxicological factor. Of the 45 interesting leads coming out of the projected 200 families, 30 will be discarded for toxicological problems, which explains the value of detecting this kind of problem at as preliminary a stage as possible in the research.

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CSO: 3698/345

BRIEFS

BIOTECHNOLOGY NETWORK IN NETHERLANDS--"Too few firms in the Netherlands are involved in biotechnology research. Four large companies do 80 percent of the work, the equivalent of 900 man-years. But there are another 100 companies with good opportunities that do not even carry out the equivalent of 20 man-years. The base must be broadened." These are the words of Minister of Economic Affairs [and Vice Prime Minister] De Korte, speaking last Monday at the Netherlands Biotechnology Congress in Veldhoven. The congress was organized by the advisory committee Innovation-Oriented Research Program--Biotechnology (IOP-b) and the Netherlands Biotechnology Association, in cooperation with Stam Tijdschriften BV. "The Netherlands," said the Vice Prime Minister, "enjoys many opportunities in the field of biotechnology. Its scientific research is at a high level, as is its industrial capacity." According to De Korte, IOP-b, which was founded in 1981, has borne fruit. IOP [Innovation-Oriented Research Program] is supposed to support innovation in business by creating a network of universities and institutes. De Korte noted a 1986 OECD report which recommends the Netherlands approach. He expects that in 1990, when the IOP-b expires, the committee will be in a position confidently to hand its work over to business, universities and institutes. "We'll have a professional knowledge network." [Text] [Rijswijk PT/AKTUEEL in Dutch 11 Mar 87 p 3] 12593

CSO: 3698/350

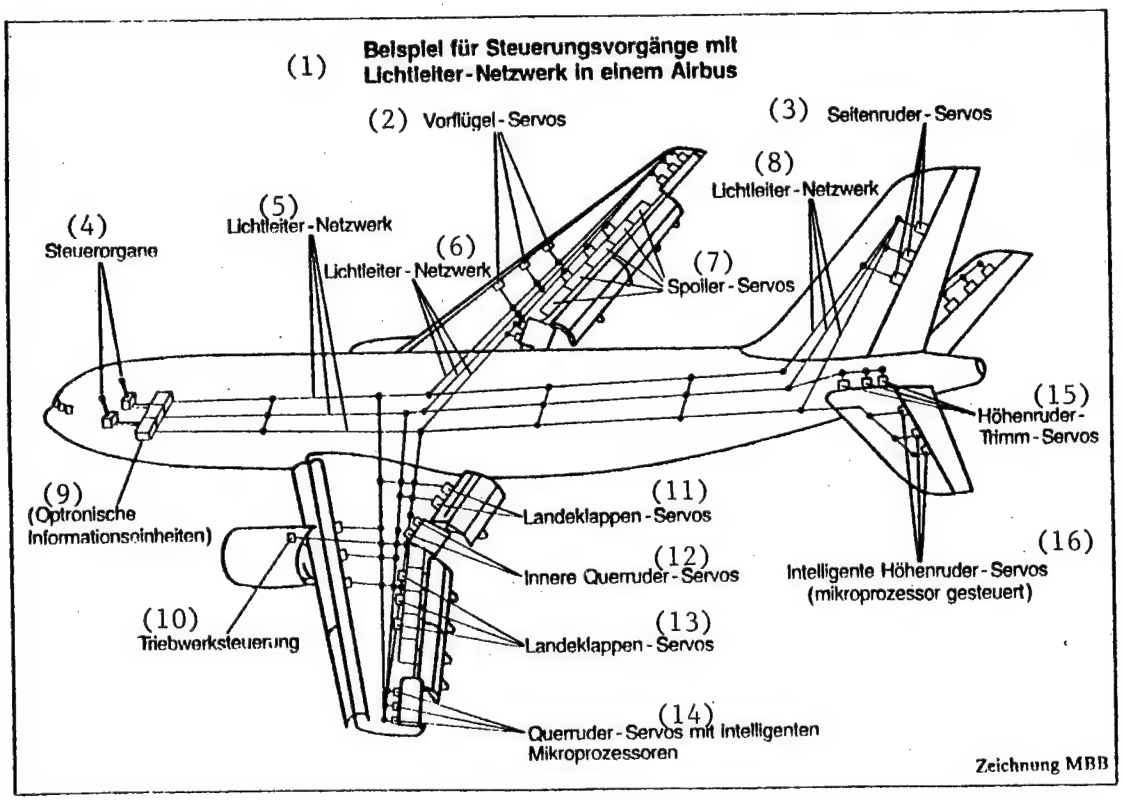
FRG: MBB DEVELOPS FLY-BY-LIGHT AIRCRAFT CONTROL SYSTEM

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
3 Feb 87 p 5

[Text] With its new control system "Lecos", the enterprise Messerschmitt-Boelkow-Blohm GmbH (MBB), at Ottobrunn near Munich, now wants to use light conductor technology also to control aircraft. Lecos is the abbreviation for Light Electronic Control System. According to the representations of the enterprise, it uses glass fibers and light of various colors to transmit control instructions from the aircraft cockpit to the control members of the aircraft. The process, which has been patented in the meantime, should primarily achieve increased safety and should be less prone to trouble. Previously the aircraft units were operated either purely mechanically to ropes and linkages, or they were controlled through electric signals and electric motors. Electric circuits, however, always represent a certain risk of sparking and furthermore can be interfered with by electromagnetic fields. This is not the case for optical wave guides. However, these are exposed to the risk of rupture, which renders the respective line useless.

For this reason MBB has designed its Lecos system in such a fashion that it retains its control capability even if parts of the optical wave guide network have broken down. As the company says, safety consists on the one hand in a triply parallel path system for signal transmission, and on the other hand in the permanent inherent control of all the optical paths including their optical networks, and not least of all in the monitoring activity of the microprocessors which initiate the control processes. The light conductors in Lecos can be compared with nerve paths, along which information can be transmitted to the respective units. The light pulses contain digitally coded control instructions. All control instructions are fed into the optical wave guide network in parallel with three light pulses of different frequency (color).

As MBB says, interference by scattered outside light on the transmission lines is impossible. Outside interfering light not only would have to use the same color carriers exactly and three times, but then also would have to use the same address of the unit that is to be moved. But this case can be excluded by appropriate steps, according to the company. For example, if an information signal from the aircraft cockpit were to be conducted along blue, red, and green light paths, the system - due to its test capabilities - recognizes which color carries the correct signal content and which color is to be used



Key:
1. Example of control processes with an optical wave guide network in an airbus.
2. Slat servos
3. Vertical rudder servos
4. Control elements
5. Optical wave guide network
6. Optical wave guide network
7. Spoiler servos
8. Optical wave guide network
9. Optronic information units
10. Propulsion control
11. Landing flap servos
12. Inner aileron servos
13. Landing flap servos
14. Aileron servos with intelligent microprocessors
15. Elevator trim servos
16. Intelligent elevator servos (microprocessor controlled)

for signal transmission in case the optical wave guide lines break down. These procedures are supposed to be permanently programmed.

In practice, the situation is as follows: If the pilot or the programmed autopilot intervenes in the elevator control, an electrical control signal is generated by the microprocessor that is connected with the control horn in the cockpit. A light transmitter converts this signal into the three colored light signals and subsequently provides it with the appropriate address of the elevator actuator unit. The optical receiver of the elevator servo again converts the light signal into an electrical one and transmits the control instruction to the microprocessor at the elevator. Together with its software, this microprocessor takes over initiation of the control process.

The safety concept of Lecos also includes the feature that the information contained in the three different optical signals is present at each node point of the optical wave guide network. In the view of MBB, this has the advantage that the control information remains completely preserved in the residual network even if optical wave guide meshes and/or coupler nodes in the network are disturbed or destroyed. Failed or disturbed components and conduction systems are covered either by parallel functional components and conduction paths, or else their tasks are taken over by other units, with postponement of less important functions. Care need only be taken that the transmission system is continuously supplied with the required power.

According to the representation of MBB, it supposedly is thus for the first time possible, in the development of air control technology, to continue the flight safely even if important control or transmission components have failed or are subject to interference, because the control capability is supposed to remain preserved. In addition, the system is supposed to have the advantage that it can be operated with considerably less maintenance effort. Incidentally, this technology supposedly is not limited to aircraft. It could also be used in similar form for land and water vehicles as well as for verification and control systems in industrial processes.

8348
CSO:3698/348

FRG: MBB TESTS A320 SECONDARY FLIGHT CONTROL

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
18 Feb 87 p 5

[Text] The systems of secondary flight control for the aircraft Airbus A320 are currently being subjected to qualification tests at Messerschmitt-Boelkow-Blohm GmbH. In important areas, these researches will be concluded before the initial flight. They emphasize the demonstration of safety in case of accidents. Complete, early system integration before the first flight allows ongoing verification of the mechanical, hydraulic, electrical and electronic subsystem linkages and compatibilities. At the present time, performance and function proofs under normal and under breakdown conditions stand in the foreground. For this purpose, the hydraulically driven mechanical transmission systems are guided and monitored by redundantly designed computers.

For reasons of economy, only the left slat and landing flap systems have been built with original accuracy on a scale of one to one. Measurement sensors, safety-relevant components, as well as a torque simulator supplement the actuator systems on the right wing side. During the demonstrations, the MBB experimental station at Lemwerder simulates air stresses which reach 3.5 tons at the stations, or more precisely about 50 kilonewtons at the inside flaps and about 70 kilonewtons at the outside flaps. With the flap system, the computer-guided air stresses are approximated to reality and are applied, via the landing flaps, guides, and motional mechanisms, to the transmission system.

Several hydraulic actuator cylinders in the load stations (three at the outer flap, two at the inner one) should make sure that the air stresses are true to the original in magnitude and direction. Here it has been stressed that the loads are applied to the flaps practically without weight, which means that the "massless" stress is essentially decoupled from the original system. With the flap system, the load simulation furthermore is designed in such a way that the functioning of the system can be tested under realistic wing deformations (up to 2.05 g). For this purpose, the flap-system testing can be correspondingly lowered station by station.

With the slat system, the specific air stress is applied in the form of a torque, under computer guidance, directly to the transmission train at the ten (five pairs) slat drive stations. The load control computers can be programmed with various load profiles in dependence on the flight missions, and can

correspondingly apply the stress pulses. The control computer is an inherently safe system. If needed, it can issue the required safety instructions all by itself, to avoid destruction of the systems. The results of the hardness test are being documented for the approval agencies. They will receive these data together with the verifications for components and systems, in the form of the final "QTR". This qualification test report is a guarantee for the development experts at MBB that later, when the A320 is really airborne, they will be safe from surprises.

8348
CSO:3698/348

NETHERLANDS: FOKKER ASKS STATE SUPPORT FOR A340 PARTICIPATION

Rotterdam NRC HANDELSBLAD in Dutch 3 Mar 87 p 13

[Article by an NRC HANDELSBLAD staff writer: "Fokker Asks Government Support for A340 Project--Negotiations with Airbus Almost Complete"]

[Text] Rotterdam, 3 Mar--Fokker will submit a request to the government for support in the amount of "several hundred million guilders" for participation in the A330/340 project of the European aircraft consortium Airbus Industrie. When asked this morning, a representative of the Ministry of Economic Affairs stated that such a request has not yet been submitted.

According to the Fokker spokesman the request will be submitted shortly. "At this moment the talks with Airbus are still continuing. We hope to have them completely finished in a few weeks." Fokker is talking with Airbus about producing "moving parts of the wing."

Fokker pays part of the costs of all its projects itself. The government provides the remainder of the necessary funds in the form of interest-free loans through the Netherlands Aircraft Development and Space Flight Institute (NIVR) in Delft. In addition, banks provide loans that are guaranteed by the state. Fokker is already participating in the production of the A300 and the smaller A310, available in several models. The percentage of participation varies from 1.0 to 5.6 percent.

Fokker wants a 4-5 percent participation in the A330/340 project. Some time ago Airbus Industrie announced that it intended to decide at the end of this month whether or not to go ahead with production of the A330 and A340. Whether that schedule will be kept is an open question since the governments of France, Great Britain, and the Federal Republic of Germany still have to decide about the requests for aid submitted for this project by Aerospatiale, British Aerospace, and Messerschmitt-Bolkow-Blohm, respectively, the most important partners in Airbus Industrie.

Airbus has already concluded subcontractor agreements with Fiat Aviazione and several Australian aircraft manufacturers. Fokker wants to participate as what Airbus calls a "constructeur associe" [associate manufacturer]. This involves somewhat more responsibility than does the role of subcontractor. Fokker would be bear certain, limited risks for the parts it produces. It

would not be responsible for the risks involved in the overall commercial operation. One problem in Fokker's negotiations with Airbus is the consortium's demand that contracts be denominated in U.S. dollars. "Airbus says, 'I sell in dollars and therefore I want to pay my subcontractors in dollars.' So the question is whether in that case you can agree on a price that will cover your costs and whether the exchange rate risk is not too large," says Eng H. J. Wennink, head of the NIVR's aviation section.

Airbus currently has plans for two models of the 4-engine A340, the 200 and the 300. The A340-200 will have a capacity of 262 passengers in three classes and a range of 14,550 km. The A340-300 is to carry 295 passengers (in three classes) and have a range of 13,000 km. The 2-engine A330 will have a capacity of 328 passengers (in two classes) and a range of 9,300 km. The aircraft will both have the same type of wing and will be very similar in other respects as well (including the advanced control systems).

Airline interest in the A340--a direct competitor of the 3-engine MD-11 which McDonnell Douglas developed from the obsolete DC-10--has increased since it will be available with a new, economical engine. This engine, the V2500 SuperFan, is being developed by International Aero Engines, a consortium of eight manufacturers from five countries.

12593
CSO: 3698/352

NETHERLANDS FOKKER WANTS PARTNERSHIP IN AIRBUS A340

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 5 Mar 87 p 13

[Article: "Fokker Partner in New Airbus?"]

[Text] Frankfurt, 4 Mar (JH)--The Dutch aircraft manufacturer Fokker is negotiating with the Airbus consortium on participation in the program for the new models A330 and A340. According to reports from Amsterdam Fokker wants to take over production of the movable portions of the aircraft's wing and tail surfaces if the Dutch Government provides a subsidy. There is talk of as much as 500 million gulden (around DM 440 million). The Royal Dutch aircraft factory Fokker is by far the largest manufacturer of small aircraft having 50 and 100 seats and is to a lesser extent a participant in the construction of the long-range aircraft A300-600 (5.6 percent) and of the A310 (1 percent). The company has recovered well from financial difficulties which it had encountered at the beginning of the eighties. A takeover by Airbus Industries in Toulouse came to naught at that time and cooperation with McDonnell-Douglas was dropped by the American partner. Fokker's profits had gone into a slump last year because of development costs for new models, as the firm's management has explained. After a long contract for 100 aircraft of the type Fokker 100 last December the firm had asked the Dutch Government and its house banks for financial support. One-third of the stock is held by institutional investors and 20 percent of it is held by Northrop, the American concern. The rest is in private hands.

8008
CSO: 3698/353

BRIEFS

AIRBUS WINDSHEAR DETECTION DEVICE--Airbus Industrie is stressing the research and improvements designed to increase the safety of its Airbus A.320, A.310-300, A.340 and A.330 aircraft: a document recently published by the company identifies the main steps being taken. The ground vibration tests of the first Airbus A.320, which were completed last November, yielded positive results and the company is looking forward with satisfaction to the first flight of the aircraft in March 1987. These tests, which lasted four weeks, involved two stages: takeoff simulation and landing simulation. Airbus Industrie is trying to improve the reliability of its aircraft at flight beginning and at flight end. Windshear, the most dangerous form of which is called microburst, represents a danger for the aircraft during these flight phases. Windshear occurs when a cold air mass nearing the ground starts going in all directions; the aircraft then loses altitude and the pilot is unable to react. To protect aircraft against these phenomena, Airbus Industrie has developed an automatic guidance system, the "alpha-floor." This computer-controlled device will detect windshear before the pilot does and will react accordingly. In addition, technical improvements were made in the Airbus A.340 and A.330: use of Al-Li alloys, improved braking efficiency, flexible cabin layout. But Airbus Industrie's efforts have focussed mainly on cabin furnishings. The materials used are fire resistant and have a low toxicity. These changes will increase passenger safety; according to a recent Boeing study, the leading cause of death in aircraft accidents is the fire which starts after the impact. Toxic fumes from the materials previously used would prevent full evacuation of the aircraft. [Text] [Paris AFP SCIENCES in French 15 Jan 87 p 23] 9294

CSO: 3698/260

EUROPEAN ADVANCES IN SOFTWARE ENGINEERING DESCRIBED

EAST Project

Paris ENJEUX in French No 75, Dec 86 pp 23-26

[Article by Philippe Guerit, director general of the Societe Francaise du Genie Logiciel [French Software Engineering Company] (SFGL): "EAST (EUREKA Advanced Software Technology)--EUREKA Project"]

[Excerpt] Considerable efforts in research and development have been made over the last few years in the new science of software engineering throughout the industrialized countries of the Western world. It would be beneficial today to industrialize the products resulting from this research in order to master software developments and to achieve the productivity increases that will allow our software industry to maintain its position at world level.

Thus, important initiatives are underway in the United States, financed largely by the Department of Defense; these include the STARS project and the creation of the Software Engineering Institute (SEI) at Carnegie Mellon University. Other initiatives are being implemented by electronics firms (Microelectronics and Computer Technology Consortium) and by major aerospace companies (Software Productivity Consortium).

In Japan, the "Fifth Generation" program represents a very significant effort toward the development of new hardware and software technologies, whereas the Sigma project targets results for the shorter term.

To come to terms with this situation, a group of French manufacturers--Bull, Cerci, Sesa, Syseca, Steria, Informatique International Eurosoft--have formed the Societe Francaise du Genie Logiciel (SFGL), with the goal of developing and marketing software engineering products and workshops.

This firm, along with other European companies (from Denmark, Finland, Italy, and Switzerland), is heading a EUREKA project to produce software engineering workshops, approved on 30 June in London by the European ministers.

The EAST Project

The Concept of an Integrated Workshop

Over the last few years, efforts have been directed primarily at producing high-level languages, first with the development of Pascal and, especially, more recently, with Ada, which is more suited to the development of large-scale applications. Along with these developments, critical progress in compiling tools (the independent nucleus of target machines, cross compilers, parameter code generators...) has been made.

Today the functions offered generally cover only a limited part of the life cycle, that is, primarily the programming and test phases along with the associated configuration management capabilities, which are growing steadily. Environments based on Unix are independent of language but their tools are not highly integrated. On the other hand, certain environments totally dependent on languages such as Interlisp or the Smalltalk systems offer highly integrated tools.

An important stage was reached with the 1980 Stoneman report (Footnote 1) (STONEMAN--Requirement for Ada Programming Support Environments--"STONEMAN" U.S. Department of Defense--February 1980) of the DOD which defined the specifications for an Ada environment (APSE [Ada Programming Support Environment]) integrated around a database, and aiming to implement a portable central nucleus (KAPSE) with tools built onto it.

Many tools exist today; most are programming, reference, or project follow-up tools. These tools mostly depend on the development context and are not well suited to an independent organization or approach. Finally, not all the life cycles of software are covered; large gaps still exist in development activities and technical support required by software in use.

Technical Orientations

The criteria used in the definition of the range of EAST workshops take into consideration:

--a needs study;
--an analysis of the competition;
--work carried out in Europe within the context of ESPRIT projects, and more especially in France with the PNGL [National Software Engineering Project] (Emeraude) and the CNET [National Center for Communications Studies] Concerto project.

The ESPRIT project called "Portable Common Tool Environment" (PCTE) (Footnote 2) (PCTE functional specifications--Bull, GEC, ICL, Nixdorf, Olivetti, Siemens, 1985) permitted the definition of a distributed workshop architecture with work stations interconnected by an Ethernet-type local area network, a portable operating system, and an associated database. This work is now recognized worldwide as a first step toward formulation of a standard in the field of software engineering workshops. The industrialization of this research within the framework of the French EMERAUDE project (Footnote 3)

(EMERAUDE--functional specifications for the EMERAUDE host structure--GIE EMERAUDE--February 1985) was undertaken by SFGL.

The CONCERTO project (Footnote 4) (CONCERTO--Software Engineering: Presentation Technique--CNET Lannion, 4-6 February 1986) focused on the problem of architecture and workshop integration, on structural editing techniques, and on the ergonomic aspects of graphics work stations.

Several other research projects are currently studying new and promising approaches to software engineering: new languages, and development management.

The adoption of formal specifications in software development makes this first essential phase more secure by making it possible not only to reduce the number of errors, but also to produce a prototype of the final system at reduced cost. It also allows us to predict a possible "trend" in further phases of development which plays an essential role in maintenance, for example. It should also improve conditions for re-use of software and for the design of components.

However, many problems still have to be solved before these mechanisms can be applied industrially. Currently, it seems more urgent to allow the various standards already existing (Petri network, abstract algebraic types, for example) to coexist within a single system definition for which they offer different representations of complementary aspects (dynamic, statistic, etc.) rather than to define a new universal standard. Use of these new techniques in industry will only be possible when suitable tools exist, which have yet to be designed and developed.

In the field of programming languages, new trends have arisen along with the development and refinement which tends toward more rigorous algorithmic languages, of which Ada is a vivid example. These trends primarily are linked to artificial intelligence technologies.

More progress is needed in the field of software use and maintenance. Tools have to be capable of adapting to the environment of each enterprise. The tools currently in use appear positive and are not strongly linked to development tools.

In brief, current technical analysis of software engineering shows several promising research approaches which are in strong contrast to the lack of environments available to developers.

Considerable efforts still have to be made to industrialize and to integrate the first results. This is the goal that SFGL has set itself in its workshop development policy described below.

Classifications of Workshops

The classification of engineering software workshops drawn up by SFGL reveals three main classes of workshop users:

--systems and real time data processing;
--management applications;
--artificial intelligence.

Systems data processing combines in a single category a group of activities characterized by strong interactivity or hardware/software dependence and serious constraints on use (environment, response times...).

This category includes:

--basic software
--real time systems
--telecommunications systems
--on-board systems.

Management applications are characterized by extensive software which is, however, not highly complex and constraints on use are generally less serious. Since it has a long life, the need for maintenance (corrections and development) is basic.

Artificial intelligence constitutes a special applications area which uses specialized languages (Lisp, Prolog...) and techniques which will eventually be highly developed.

SFGL seeks to cover a great number of the requirements identified. Thus, the range of workshops supports a large number of programming languages:

--procedure oriented languages; the ones most commonly used in systems data processing are Fortran, Pascal, C, Ada, and LTR 3;
--Cobol, still used primarily for management applications;
--artificial intelligence languages: Lisp, Prolog, object-oriented language of the Smalltalk variety.

Presentation of EAST Workshops

Hardware Architecture

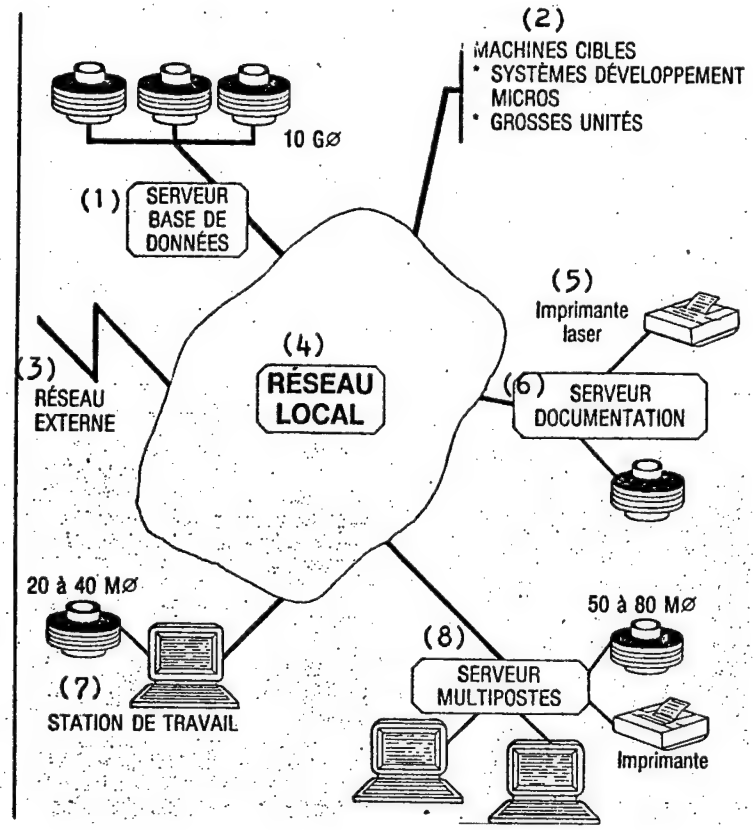
A distributed workstation architecture was deliberately selected as being the most efficient. Thus, EAST workshops are organized around an Ethernet-type local area network which interconnects the following components (Fig. 1):

--single-user graphics workstations built around an Apollo or Sun workstation machine, or at the lower end of the range, around a personal computer (IBM-PC AT or compatible);

--specialized servers: multi-station SPS-7 server, database server, reference server, etc.;

--target machines: their connection to the workshop allows, on the one hand, migration of the application toward its final use environment; on the other hand, it allows the use of existing facilities on the target machine from the workshop itself.

Figure 1



Key:

1. Database server
2. Target machines
   --microcomputer development systems
   --large units
3. External network
4. Local area network
5. Laser printer
6. Documentation server
7. Workstation
8. Multistation server

Telecommunications gateways permit interconnection of several workshops located at some distance from each other using data transmission networks,

Associated with this architecture are the functions which make the environment a real workshop, that is a group of devices which enable an integrated team to work on the development of a single project.

This definition as a collective unit distinguishes EAST workshops from most products available today, which mostly appear to have been made to assist an

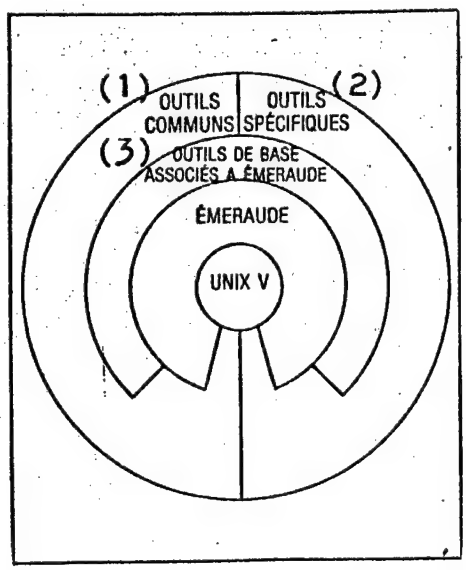
individual in his work while enclosing him in a cell isolated from other people.

Software Architecture

EMERAUDE

The EMERAUDE host structure provides a basis for the construction of workshops. (Fig. 2)

Figure 2



Key:

1. Common tools
2. Specific tools
3. Basic tools associated with Emeraude

This structure essentially resembles a group of program-operated primitives which provide powerful mechanisms:

--basic execution mechanisms, interprocess communication, etc.;
--object management systems;
--distribution around a local area network;
--user interface.

Basic Tools Associated With EMERAUDE

Above the EMERAUDE system are a certain number of basic tools which are distinguished by the fact that they are totally linked to the nucleus itself.

These tools supply the high-level functions allowing the use of the host structure mechanisms as well as the resources necessary for tool integration.

This provides mechanisms which are essential for development and certain tools specific to software engineering.

The Common Tools

These are software engineering tools of general interest which are common to the different types of workshops.

This category includes:

--project management tools;
--the documentational environment;
--configuration management tools;
--tools for text editing and manipulation: these tools, which use descriptions of standards, permit text processing as a sequence of structures which respect the defined standard rather than as a sequence of characters;
--the execution environment and unitary tests;
--tools for software analysis and measurement;
--tools for workshop-to-target machine communication.

The Specific Tools

In contrast to the common tools, the specific tools are dependent on the application field of the software to be developed.

Their choice and integration allow definition of the various types of workshops.

The specific tools directly assist development teams; consequently, they are always associated with a specific phase of the life cycle. These tools assist the implementation of the various standards applied during development.

Each of the three types of workshop described has its own approach to the software development process. Thus, we can distinguish between three different types of standards and associated tools which, however, have two features in common:

--The standard must, above all, lead to a complete document of formal, precise, unequivocal specifications which can be processed automatically.

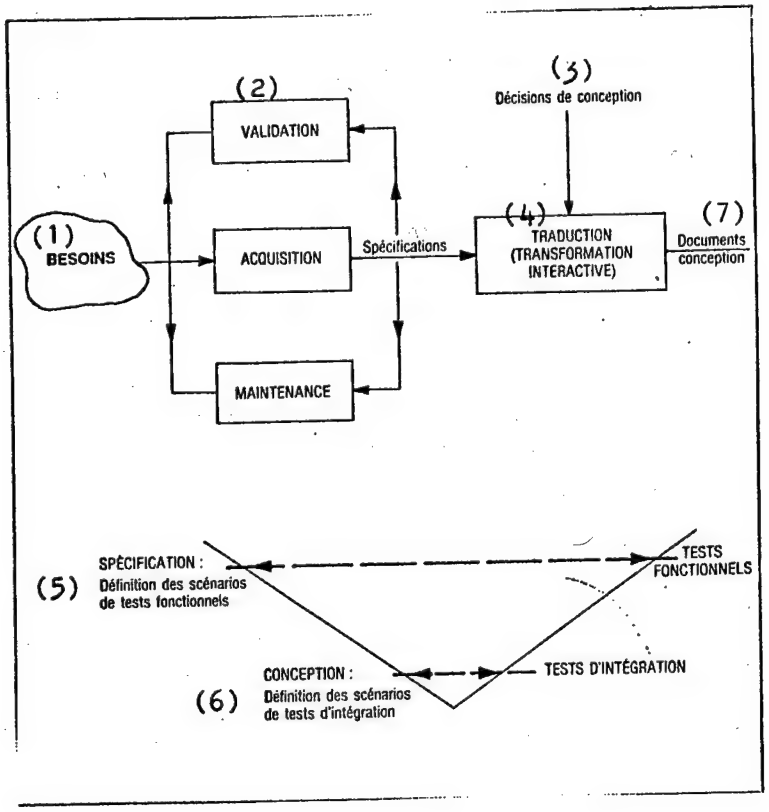
--The standard must be easy to learn and use in order to ensure its acceptance in practice.

These following two constraints mean that priority is given to legibility and ease of implementation for the execution of the formal specifications.

--The formal specifications must be capable of being validated.

--Once validated, they must be readily usable in the design (interactive translation), testing, and maintenance phases (Fig. 3).

Figure 3



Key:

1. Needs
2. Validation
3. Design decisions
4. Translation (interactive transformation)
5. Specification: Definition of functional test scenarios
6. Design: Definition of integration test scenarios
7. Design documents

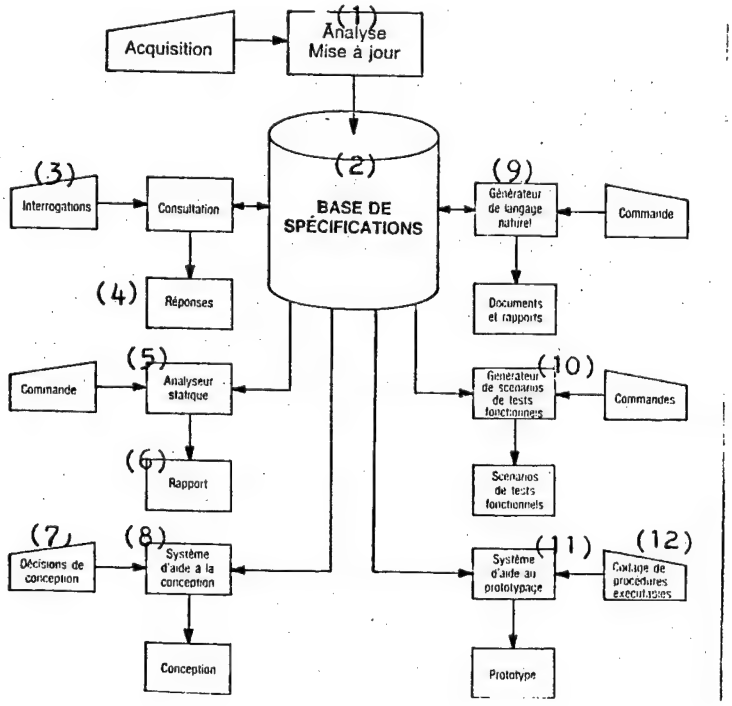
The tool box which meets these criteria includes:

--a tool for acquiring specifications;
--a natural language generator (paraphraser), the function of which is to produce, on the basis of formal specifications, a document written in pseudo natural language which makes it directly usable even by a non-specialist in data processing;
--a tool for consulting the specifications;

--tools for static validation of the specifications (static analysis, theorem proofs...);
--an interface toward a design support system (use of definitions and of concepts introduced in the specifications);
--a generator of functional test scenarios.

The last three tools are designed as assistants. Although it is impossible to imagine total automation of the tasks in question, a certain distribution of labor can be effected: The important decisions are made by the developer while the tool applies the formalities of the specifications.

Figure 4



Key:

1. Analysis; updating
2. Specifications base
3. Inquiries
4. Responses
5. Static analyzer
6. Report
7. Design decisions
8. CAD system
9. Natural language generator
10. Functional test scenario generator
11. Computer aided prototype production system
12. Encoding of feasible procedures

To conclude, it appears that, in order to deal with the immediate industrial situation in software development, the European countries have made efforts which, in terms of time and quality, have allowed them to meet the worldwide challenge. Now it is necessary to translate the results of this work into concrete terms with actual industrial products which allow development firms to increase productivity and improve the quality of their output.

The SFGL company has set itself the goal of designing, producing, and marketing a complete range of such workshops. The definition of this product line is based on preliminary studies, particularly needs analysis, market analysis, and research into types of workshops.

The development of this line of workshops will take 6 years. An initial product line, for which feasibility studies already have been performed, will be available within the next 3 years.

The next step will see the introduction of advanced tools, based in particular on artificial intelligence techniques.

Beginning with the first generation, and particularly in the second generation, significant productivity increases will be achieved in the software industry.

However, taking into account the new technologies put into operation (particularly the use of new standards in the upstream phase of development) which currently have a weak tool base, considerable efforts will still be necessary to encourage use of these new resources in industry.

ESPRIT Coordinator Critiques PCTE Project

Paris ENJEUX in French No 75, Dec 86 pp 27-30

[Interview with Pierre-Yves Cunin, technical coordinator of ESPRIT Sub-Program 2: Software Technology, under the headline "A Common Software Tool Environment: The PCTE Project"; date and place not given]

[Text] ENJEUX: A large-scale project called PCTE [Portable Common Tool Environment] is underway to develop common portable software tools. We have already seen positive results in the form of the important French product, Emeraude software. What is the present status of the project?

P.-Y. Cunin: First, I would like to say something about Emeraude. The PCTE project, which was launched in 1983, has in fact just produced EMERAUDE in the sense that EMERAUDE is regarded as a commercial product of PCTE, and corresponds to a version written in C language based on the Unix V system. But we must remember that the ESPRIT program was conceived to promote precompetitive R&D activities and not to get directly involved in the development of industrial products, which are supposed to be the responsibility of consortiums. EMERAUDE is a typical example of this. Having said this, where do we stand with the PCTE project? At the moment, it is not finished. There are a certain number of steps yet to be taken.

On the one hand, it would be beneficial to develop an Ada-oriented version so that people working with Ada can have an APSE (Ada Programming Support Environment). In fact, what is needed at first is not a complete rewrite of the product in Ada, but the design of large-capacity libraries which enable Ada users to work with Ada primitives interfaced with language C PCTE primitives.

On the other hand, we are dealing with the issue of placing tool interfaces in the public domain so that companies can develop tools that are compatible and can be transferred from one machine to another, starting, obviously, from the time when these machines have a PCTE implementation. Along with the development of tools, we have paid special attention to interface problems.

Thus, within the framework of cooperation promoted by PCTE, a group of major industries--called the X Open Group--was formed to support the adoption of an interface standard for operating systems for machines developed by European manufacturers. Two American companies, DEC and Sperry, joined this group composed of five of the partners in the PCTE project, namely Bull, Philips, Olivetti, ICL Nixdorf, and Siemens.

In addition to this, we are also studying the establishment of a supervisory body for PCTE interfaces which will control developments and prevent uncoordinated proliferation of modifications which would nullify all the efforts undertaken to develop portability.

Therefore, we have to examine what can be done in terms of standardization so that PCTE, already a de facto standard, will be recognized as an official standard on the international level.

Still within the PCTE framework, other projects have been launched to complement PCTE since this project only supplies a foundation for a portable common tool environment.

First, there is the PACT (PCTE Added Common Tool) project, dealing with the definition and implementation of a certain number of general tools such as a language for the processing, retrieval, and definition of data. Then there is the SAPPHIRE project to study the portability of the PCTE or of EMERAUDE to other machines such as the VAX 750 or SUN, or to other systems such as the Unix 4.2. Let us also mention here a project dealing with the portability of the PCTE to the VMS, a system widely used in microelectronics in particular. The needs of these manufacturers--in terms of systems development environments--are very substantial, and this is the reason for their interest in the project.

I would conclude this introduction by mentioning one final project that will undoubtedly have a great impact on standardization. This is the VIP (VDM Interface for PCTE) project, which aims to produce formal specifications for the PCTE interfaces, primarily by using the VDM method. Certain aspects will undoubtedly be difficult to specify with VDM; and this will force us to use other formal methods. It is evident that there will be an urgent need for a formal definition of this kind, especially when the certification stage is reached.

Indeed, who will verify whether this or that product is really an implementation of PCTE? Similarly, who will verify the compatibility of a tool with a PCTE interface? Because of this, we have to have a formal definition to validate the tools. This activity is an integral part of the move toward standardization. We believe that progress will be made between now and the end of the year, not so much in producing solutions as in defining them.

This is a description of the PCTE situation. To conclude, I would add that we are in the process--as part of the call for bids we have issued--of proceeding to the evaluation of projects that will provide a basis for the creation of more advanced environments of the future.

ENJEUX: The common tool environment certainly is an important element. Within this approach, what will the position of PCTE be in prolonging Unix?

P.-Y. Cunin: The idea initially was to consider PCTE as a phase in the evolution toward a new style operating system. Consequently, one of the criteria adopted was Unix compatibility for PCTE, to take advantage of all the existing Unix tools, and to permit Unix users to migrate to PCTE gradually. PCTE is deliberately designed in a progressive form because of the services it offers.

However, there are substantial differences between PCTE and Unix. There are three major differences. The first is that there no longer is a classic tree file management system, but rather an object-management system (SGO) based on the entity-relation model.

The second difference concerns the distribution of activities and resources over an Ethernet-type local area network to which different PCTE workstations are linked. This distribution is totally transparent to the user.

The third difference concerns the user interface. This now is becoming fairly standard, with advanced environments--such as screen, graphics, multi-windows, mouse, etc.--which are not in general use on operating systems, particularly Unix.

Roughly, these are the principal features which distinguish PCTE from Unix.

ENJEUX: At the same time, the EAST project, under the aegis of the EUREKA program, is mobilizing European research. What can we expect from ESPRIT and EAST, assuming that their results are mutually productive and do not duplicate each other?

P.-Y. Cunin: An interesting question. First, I would like to say one thing: EAST is a project, whereas ESPRIT is a program containing numerous projects (for example, more than 45 projects in software technology). Generally speaking, as I already said, ESPRIT will not create industrial products directly. There will be a lot to do between the prototype stage--even if validated industrially in one or two cases--and commercial exploitation of the product.

EUREKA, on the other hand, has to supply products directly; moreover, the success of these products on the market will lend credibility to the projects.

As for EAST, we should not be surprised at the relationships already existing with ESPRIT, and with PCTE in particular, since a consortium has been created around these two projects. It is evident that EAST will benefit greatly from the results of PCTE, a project we consider practically finished, since only 1 year remains of the 4 years of work we originally planned. Therefore, there will be no real overlapping of EAST and PCTE. It is evident that we will follow EAST not on the basis of its interim goals but from a global perspective, so that duplications between, for example, the PACT project already mentioned and EAST can be avoided.

We fully agree that arrangements should be worked out between the ESPRIT and EUREKA projects so that developments in one project are not duplicated by the other one.

Within this perspective, we will examine both the technical side of things and the management aspect as well.

The ESPRIT Management Committee (EMC), made up of representatives of the administrations of the member countries, is very attentive since no one wants to spend money on both aspects. But no firm structure has been established at the present time to monitor possible financial duplications. In theory, reviews will be made on a case-by-case basis. However, particularly for EAST, this should not be a problem, since we have a very good relationship with the people responsible for the project.

But in fact it is a little premature to predict what will happen. Let us wait and see how the situation develops, as EUREKA still is only in the initial stages.

ENJEUX: In terms of international strategy, what do you consider ESPRIT's place to be in international competition, especially with regard to the American and Japanese software industries? In the same context, will ESPRIT be able to come up with something concrete by 1992, the date set for completion of the single internal market?

P.-Y. Cunin: I do not think that the ESPRIT partners are badly placed in international competition. To support this, I could mention the contacts made recently--at their initiative--by the Americans and Japanese with the directors of the projects. Up until now it has mostly been the reverse. From this point of view, PCTE has been an extremely strong driving force, especially in the sectors that use Ada.

With regard to the Japanese, it is difficult to say whether they are ahead or we are because they have centered their program around the fifth generation. A priori, from what we know, the Japanese were a bit optimistic and apparently they are experiencing some difficulty in reaching the goals they set for themselves. This explains their interest in the work of ESPRIT, both in

terms of software technology and in terms of advanced data processing systems, which are covered by Sub-program 3 of ESPRIT.

With respect to the United States, the projects are much more similar. There is, however, one difference--namely the military orientation of their work. This is definitely not the case with ESPRIT.

In certain areas, particularly those concerning high-level languages like the SETL language, the Americans are undoubtedly more advanced than the Europeans. On the other hand, it is just the opposite for environments, where we are clearly ahead.

As for the 1992 deadline, by then we should have products available on the market from exploitation of results of Phase I of ESPRIT. As I already said, Phase I is almost complete. This means that all the projects launched in 1984-85 should produce results around 1990.

On the other hand, it is evident that this will be too early for Phase II. We are currently in the process of putting the final touches to our work agenda. The final presentation document should be submitted to the Council at the beginning of next year.

This means that the first projects will get started in 1988, and it would be premature to expect concrete results by 1992. We will have research results by then but probably no products.

ENJEUX: What is the scope of Phase II?

P.-Y. Cunin: ESPRIT II will cover more sectors in comparison with ESPRIT I, which primarily focused on research and development rather than on actual transfer of technology.

In Phase II, R&D of advanced tools will still play a part, but this phase will be more oriented toward the development of industrial prototypes to get a little closer to the product.

By placing the emphasis on technology transfer, we should be able to attract more companies who are interested and involved in applications. In ESPRIT I there were what we call type A projects, those with an industrial orientation, and type B projects, research projects. These types of projects will appear in very similar form in ESPRIT II.

To assist technology transfer and integration, we have defined within ESPRIT II what we call TIP's (Technology Integration Projects) which will cover broader areas than the current type A projects. They will integrate many of the results of ESPRIT I, as well as those already available from the major companies participating in the projects. These companies certainly will sub-contract a good part of their work load so that there will be a Community policy in the industrialization of products.

TIP projects in ESPRIT II will require major investments. These will be fewer in number than the A and B projects, and this means that there will be a rigorous selection policy. But the structures will not be totally rigid.

Since information technologies are evolving rapidly, it will be possible to make changes during annual revisions, as in Phase I of ESPRIT.

ENJEUX: Is all this effort to be concerned only with projects and studies on Ada language?

P.-Y. Cunin: If you want a categorical answer, I would say no. Our efforts cannot be concerned with Ada language projects only. If it were necessary to choose, I would say that Ada is fine, but it is not the language for the long-term (beyond the year 2000).

Ada is an algorithmic language falling within the category of traditional languages like Pascal. It includes powerful concepts for making models of parallel tasks, for processing of exceptions, and for presenting a generic, modular approach.

Theoretically, the approach adopted by the DOD might seem surprising, since language requirements were defined before those of the environment.

Intellectually, the inclination would be to work in the opposite direction, that is, first to specify the environment in terms of functionality and to define the language based on that. Having defined the language first, one becomes tied down, running into difficulties when one wants to "go beyond" the language possibilities.

If you ask me whether we need to deal with Ada-oriented environments, I would of course answer yes. From this point of view, Ada is the focus of several research projects implemented both under ESPRIT and within the multi-year program for the data processing sector which is receiving considerable support from the Commission.

Within the ESPRIT framework, first there is PCTE. I have already spoken about it at length. I would simply add that studies have been undertaken to compare PCTE with an American document (RAC) which defines the requirements for Ada environments. It has emerged that PCTE is decidedly more advanced than its competitors and satisfies approximately 90 percent of the requirements (its principal shortcoming is in the security area).

I might mention another example, the PROSPECTRA (Program Development by Specification and Transformation) project, which aims at developing a rigorous, automated Ada program development approach on the basis of a formal specification. The use of Ada as a standardized language and the specifications using Anna language annotations will guarantee transferability between the different APSE's (Ada Programming Support Environments).

Within the multi-year program for the data processing sector, work on Ada is based on two large complementary projects: a family of portable Ada compilers

and a portable programming support environment Ada-(MAPSE). We should also mention here all the R&D activity being conducted within national programs.

To conclude, I would say that while you cannot base everything on Ada, you cannot forget about it either. I do not know if Ada will be the last algorithmic language; perhaps it is both the apotheosis and the swan song of these languages as they exist today. Based on my close experience with many studies on Ada, I can say that Ada is not a simple language. As proof I can mention the fact that there are few "good" compilers on the market, although this language has been in existence for many years.

ENJEUX: Let us suppose that we are on an equal footing with our international competitors concerning the development of software systems. There still remains the big problem of reliability and quality of software, a problem which led to the launching of the REQUEST program in 1985. A major debate has begun specifically concerning the usefulness of formal methods. How have Europeans come to grips with the whole problem in REQUEST?

P.-Y. Cunin: A difficult problem! And it is the one that concerns us the most at the present time. The strategy we have adopted has two specific goals: to increase productivity and to increase quality.

To achieve these goals, we have launched a few projects, including REQUEST which you mentioned. The aim of REQUEST is to develop techniques, tools, and procedures permitting us to determine, predict, measure, and guarantee the quality and reliability of computerized software.

But before we arrive at this point, first we have to know what quality is. How do we measure it and how do we interpret these measurements? In fact, quality brings into play many factors which are not easily measurable (especially human and social factors). Therefore, what is needed is to identify methods of measuring quality, to look for criteria to validate these measurements, and to develop a quantitative model for defining quality.

The strength of REQUEST was its objective of confronting this problem, which requires a certain consensus as to what quality is right from the beginning. The project directors ran into a lot of problems but they came up with an interesting result. They defined what they called Coquamo (Constructive Quality Model). This still has to be produced and tested. In fact, until it is validated, we cannot really recommend it.

Along with this research into quality definition, participants in the REQUEST project had to deal with two other problems: the certification of software products and the impact of formal methods.

Since fewer resources were used in this research, the results are far from adequate.

In fact, to measure the impact of formal methods, we have to take projects and develop them using methods that are both well formulated and correctly applied.

Moreover, rather than just one method we need "n" number of methods to establish valid comparisons. We also need to use them under equal conditions for any given product.

But, this will require considerable resources and this work can be considered only if we have complete mastery of the formal methods we hope to measure. This is not the case at the present time.

The directors admitted, in fact, that they were confronted with a virtually insoluble problem.

So it is still an open problem. Generally speaking, I would say that the question of measurements and methods is one of the weak points of ESPRIT, and of all the major programs, such as ALVEY for example.

Therefore, we decided to increase our efforts in this field. We launched a working group, SIG (Special Interest Group), which brings together top experts to define a European database prototype, for example, which would be dedicated to collecting and storing measurements of quality and reliability. It must be said that all the major companies have such measurements and that most of them are ready to cooperate. But it is rather like the principle of the "Spanish hotel" [a quick and dirty solution]: You can find all sorts of measurements there. Usually they have not been arrived at in the same way, nor under the same circumstances, nor in the same environment.

Another problem concerns the fact that often these measurements are seen as sensitive information by a company. If you carry out a measurement concerning the development time for a product, you already have some information concerning the company. If you establish a relationship between the quality of a product, the development time, and the investment required, you already have another item of information on the company. Therefore, you have to be able to make this information completely anonymous if you are to create a database that can be accessed by a broad public.

Without such a guarantee of anonymity, firms will supply their measurements but will limit the number of people who can access the information.

Therefore, we have to be able to establish a consensus which is scientifically solid in order to demonstrate that the project is consistent. For their internal requirements, REQUEST directors are going to develop a database. They have just concluded an agreement with the directors of the SWDL project of the ALVEY program who are also collecting data to use a common basic structure. But this work still is only in the preliminary stages.

Independently of REQUEST, we are also working on another approach permitting us to deal with the problem of quality. This approach should also resolve, at least partially, the problem of productivity. This second approach concerns the re-utilization of software.

According to recent studies, 90 percent of development efforts are spent on redeveloping all or part of existing software. In theory, therefore, we should be able to re-use 90 percent of software. In practice, however, it is

a very different story, but we can reasonably expect to be able to re-use 50 percent of development efforts within the next few years.

If you have quality software which was correctly developed, when you re-use it, you will obtain the same quality at a negligible cost. Therefore, re-use will encourage firms to produce quality software. They will prefer, for instance, to put 20 percent more effort into producing a better quality product knowing that they will be able to profit greatly from it later.

Therefore, we are making considerable efforts in this direction. We are trying to work simultaneously on these two activities--REQUEST and software re-use--knowing that the theoretical problems, whether they concern quality, reliability, or re-use, are still far from being solved.

EUREKA Software Factory Objectives

Paris ENJEUX in French No 75, Dec 86 pp 31-32

[Article by R. Lang of the National Institute for Research on Data Processing and Automation (INRIA), H. Tardieu of Sema-Metra, and R. Varenne of Cap Gemini Sogeti, under the headline: "EUREKA Software Factory (ESF): A Response to the European Software Challenge"]

[Text] The growing demand for software in all sectors is becoming worrisome. The annual growth rate for this demand is estimated at almost 30 percent.

In the face of these requirements, the supply of high-level intellectual manpower remains constant or, at best, is increasing much more slowly than demand.

The effects of such a situation are well known:

--extension of deadlines for beginning production of new applications;
--inflationary trends in salaries for computer specialists.

In addition, the growing size and complexity of systems and applications means that it is extremely difficult to keep a lid on software production costs, which are going well beyond the break-even point in demand.

This situation makes it absolutely vital to increase productivity in software development without jeopardizing quality.

These increases depend on:

--reduction of production time and costs;
--reduction in maintenance costs.

In addition, many industrial sectors are extremely dependent on the availability of economical software for their own production (products for the general public, automobiles, aeronautics, space, telecommunications, etc.).

The solution adopted by ESF is to create the technological conditions for a large-scale, open market for software components on the European level.

This means that European standards must be defined and applied in the following areas:

--software definition and specifications;
--interfaces;
--adequate methods and tools.

This should be supplemented with an appropriate infrastructure for exchanges on the European level. This approach should enable us to avoid becoming technologically and economically dependent on the United States or Japan.

ESF aims to answer this challenge, within a 10-year economic perspective, by dealing with the problem at an industrial level.

ESF's Objectives

ESF's basic strategic objective is to move from the artisan level to the industrial level in software. In order to do this, it is necessary to improve quality, reliability, and productivity.

These ambitious goals can only be achieved by standardizing the expertise used in software production; this standardization, necessary for maximum automation of the production cycle, requires the use of artificial intelligence technologies.

The industrial objective is to make available on the market products defined in this way, which will allow exchanges and, consequently, will enable genuine "software factories" to operate on a European scale.

The products to be supplied by these factories will be "standard, re-usable components" from which applications will be constructed.

ESF Architecture

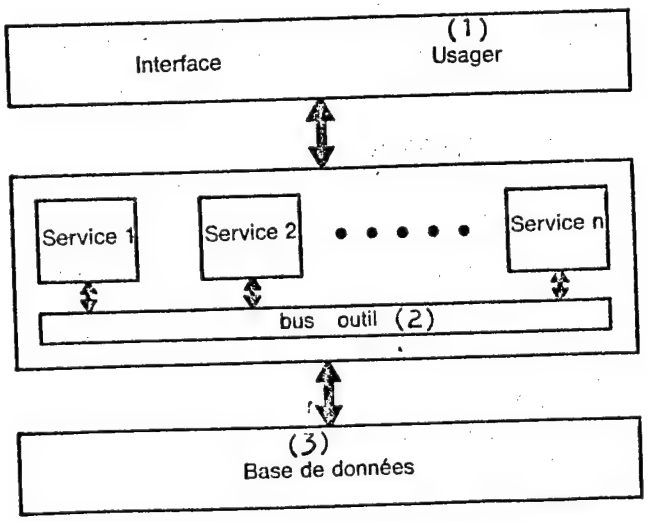
This architecture is broken down into three layers:

--a database including all the information about the production process;
--a layer of interactive services operating through a tool bus;
--a user interface layer.

ESF also is based on:

--the advances already achieved in engineering software both by the partners in the project and by the EEC (ESPRIT program);
--the use of artificial intelligence technologies to obtain an intelligent production environment;
--the complete and formal description of the modules to encourage and ensure re-use;
--necessary adaptation (configuration) according to the areas of application.

Figure 1 [ESF architecture]



Key:

1. User
2. Tool bus
3. Database

ESF Services

Interfaced on the database, the various ESF services will offer users the following possibilities:

--modeling of applications using artificial intelligence techniques (especially rules);
--transformation of specifications into programs using existing modules and components;
--development of application prototypes;
--systems specifications using specification languages;
--qualitative assessment of the software produced;
--management of software configurations;
--management of production processes.

As for the user interface, it will be based on the current conception of workstations and will allow intelligent text and graphics processing during all phases of production.

It should be noted that these concepts are already more or less in use in the software workshops of the various partners working on this unprecedented project.

The Partners

The industrial group which was formed to present this project to authorities is a European consortium composed of:

--for France: Cap Gemini Sogeti, Sema-Metra, INRIA;
--for West Germany: Nixdorf, Softlab, AEG, the University of Dortmund;
--for Sweden: Telelogic;

The following partners have joined:

--for Spain: Sofemasa;
--for Norway: CIR.

Planning

The three major phases of the project are the following:

--definition 1986-87;
--implementation of the ESF nucleus 1988-91;
--implementation by sectors 1991-95.

The completion of the first products to come out of ESF is scheduled for 1993-95.

Conclusion

In the competition for the mastery of technology by the year 2000 symbolized on the European level by the EUREKA program, the ESF project holds an especially privileged position because of the importance which industrial mastery of software production and maintenance will have in the 21st century.

In this context, a number of large industrial firms have combined their efforts and resources. It is no accident that three European software companies (Cap Gemini Sogeti, Softlab, Sema-Metra), which have invested heavily in software engineering, are involved in the ESF project, along with others, of course, with the aim of making significant progress in the industrial production of software.

We would like to wish every success to this initiative and we hope that the EUREKA Software Factory will be the basis for our future industries in an even more competitive Europe. These are the stakes in this project.

8615
CSO: 3698/M162

ESPRIT PARALLEL ARCHITECTURE PROJECT ADVANCING

Brussels INDUSTRIE in French Jan 87 p 10

[Text] The Systems and Automation Department of the University of Liege [ULG] is one of the participants in the ESPRIT PANGLOSS (Parallel Architecture for Networking Gateways Linking OSI Systems) project.

The ICL/STC company (UK) is the project's prime contractor; the other participants are the following companies: CAP (UK), PCS [Peripheral Computer Systems] (FRG), and 7-Technologies (Denmark), as well as the universities of Liege, Twente, Reading and Stirling.

The past few years have been marked by the appearance of new computer network technologies, whether these be in the field of local area computer networks, satellite links for high-volume networks using optical fiber technology, or even the integrated services digital network project. Hence the need to develop gateways linking high performance computer networks, capable of supporting the heavy traffic loads and high transfer rates generated by these new technologies.

The PANGLOSS project response to this challenge lies in parallel computer architecture. The design work requires the development of a method adapted to parallel architecture in order to be able to predict its behavior accurately. PANGLOSS is an interdisciplinary project involving a broad range of research areas, such as format specification, transformation, and implementation techniques, and performance analysis methods.

The breadth of the approach used by the PANGLOSS project is unusual. There is currently a considerable interest in the use of parallel architecture for digital and symbolic computation; however, the PANGLOSS project opens a new field of application for this architecture. It looks as though PANGLOSS will lead to a considerable increase in communications system performance.

Participation by the University of Liege enables the project to benefit from the experience acquired by ULG in ESPRIT project No 73, which aims to develop a high perfomance optical fiber network for interconnecting local area networks. The research currently conducted by the University of Liege within the PANGLOSS project involves network architecture and performance analysis. The division of tasks also calls for ULG to contribute to the analysis of functional parallelism inherent in interconnecting networks.

The initial stage of the project, which in fact began in January 1986, runs through January 1989. By then, the human resources supplied by the organizations involved in PANGLOSS will amount to more than 650 engineer manmonths. The total investment is on the order of 6 million ECU, 50 percent of which is financed by the European Commission.

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25037/12951
CSO: 3698/A094

FRENCH EXPERT SYSTEM FOR ULTRASONIC NON-DESTRUCTIVE TESTING

Paris L'USINE NOUVELLE in French 19 Feb 87 p 48

[Article by Thierry Lucas: "Data-Processing: Siracus, the French Welded Joint 'Expert'"]

[Text] This new non-destructive testing tool, used together with "sensors", helps technicians identify and locate defects on site.

The first one of its kind in France, Siracus, an expert system for the ultrasonic detection of welded joint defects, will become available in March. Usually, when a skilled operator finds a defect that is hard to identify, an expert is called on location. With the help of Siracus, a portable system perfectly suitable for workshop conditions, the technician himself, using "sensors," will be able to identify and locate the defect and read on the screen whether it is acceptable or not. This new non-destructive testing device was developed by Framentec computer experts working in close collaboration with Framatome ultrasonic testing experts.

As is known, much of the work involved in developing an industrial expert system consists in modeling knowledge. "Our two experts were presented with series of test cases," we were told by Tri Hue Nguyen, project leader for Framatorme, "and their mode of operation was monitored step by step in order to formalize their expertise." The knowledge base of the system includes 400 facts and rules.

Siracus is the offspring of Framentec's M1 software which already supports the TIG expert system for welding machine maintenance. The M1 generator was therefore adapted to the requirements of welded joint testing. First, the tool had to be suitable for use by others than computer experts. Thanks to the user interface developed for this application, the operator in guided in his search in plain language. In addition, the system is quite frequently unable to arrive at a conclusion after only one test. The operator then carries out other tests with sensors, during which he is guided and advised by Siracus which makes a synthesis of the different assumptions.

"The new version of M1, written in C instead of Prolog," Martin Deira, project leader at Framentec, explained, "will, among other things, run fast enough to arrive at a conclusion in a few minutes." It also considers variables within the logical rules of the "expert." The identification of the part to be

tested, its geometry, the type and parameters of the sensors are thus considered as variables which are entered on the keyboard by the operator, with a corresponding simplication of the cycle of the expert system proper.

Finally, and this is one of its essential characteristics, Siracus provides a true listing of the expert evaluation. Thus, the data introduced into the system are not weighted a priori: for each defect search implemented, the rules and parameters are assigned coefficients computed according to methods based on the experts' knowledge. The results are then compared to "interruption thresholds" and the system decides to accept the conclusion proposed or to continue its search.

Siracus will run on a PC-AT compatible computer with 640 kilobytes (8-bit bytes) of memory. The entire software can be loaded from a 2-megabyte diskette reader, but its designers recommend the use of a 20-megabyte hard disk that will provide faster access and will make it possible to store all the cases considered.

Siracus is now an operational product, but it is far from being final. Its knowledge base can be refined and completed whenever an unexpected defect is detected. In addition, research on the project continues in order to expand its use to various types of welded joint.

9294
CSO: 3698/362

EUROPEAN STANDARDS, GLOBAL STRATEGIES IN FACTORY AUTOMATION

Duesseldorf VDI NACHRICHTEN in German 20 Feb 87 p 25

[Article: "In-House Computer Integration: Factory Technology Speaks 'European'"]

[Text] Brussels, 20 Feb (VDI-N)--The Fiat group has called upon the EEC Commission to develop jointly with leading industrial enterprises of the EEC a European system of standards for integrated factory automation. This would be on the model of the Esprit program.

The managing director of the Fiat subsidiary Comau SpA, Paola Cantarella, declared in Brussels that within the framework of this global undertaking and as a necessary prerequisite to a European approach to standardization the commission should also take up special initiatives. These would include the short-term adoption of tested and available standards regardless of the country of origin and in joint action and promotion with universities and research centers the development of process technologies. These can serve as examining authorities for standards and for tests of new equipment.

According to information supplied by the VWD news agency, Cantarella expressed regret that neither the Japanese nor the American formulation is usable in Europe since here in Europe there do not exist any central agencies comparable with the Japanese MITI nor users of the magnitude of General Motors. The American automobile company is a promoter of the manufacturing automation protocol (MAP) which already has a European users' group.

Cantarella said that the action which has now become necessary is at the same time difficult because it is in contradiction to fundamental characteristics of the European tradition and the diversity of standards formulations which have always been characteristic of Europe.

The responsible general director of the EEC Commission, Michel Carpentier, likewise spoke in favor of a European global strategy which he said would have to base itself on joint actions involving both public and private sectors and would have to involve all the activities of production and process technology.

8008
CSO: 3698/353

EXPERT SYSTEM TO MANAGE ALUMINUM PRODUCTION

Paris L'USINE NOUVELLE in French 18-25 Dec 86 pp 46-47

[Article by Michel Vilnat: "TOTEM: An Expert in Production Series Automation Programs"; first paragraph is L'USINE NOUVELLE introduction]

[Text] TOTEM, currently the largest expert system on the European market, communicates with industrial engineers in natural language. As of 1987 it will generate production series programs for 10,000 varieties of sheet metal and metal sections at the Pechiney-Cegedur Plant in Issoire.

The world's first expert system specializing in the development of production series programs is gradually conming on stream at the Issoire plant of the Pechiney-Cegedur Group. Here aluminum alloys are cast and rolled in various forms: heavy plates (most of the structural parts of Airbus) thin sheets for airframe sheathing, silo construction, leisure vehicles, etc., and sections (U-beams, I-Beams, rails, etc.).

TOTEM (Optimized Time and Materials Processing) is already operational for the plate rolling mill and will be extended early next year to the plant's entire range (thin sheet rolling, drawing, and foundry). TOTEM is quite an expert and today implements no less than 7,000 rules! When manufacturing at Issoire is fully automated, more than 20,000 rules will be considered (by comparison, an expert system for breakdown diagnosis uses between 500 and 600).

TOTEM, currently the largest European expert system, was designed by MWM, a Grenoble data processing services and engineering company. In order to achieve the initial goals of reliabiility and user-friendliness, Cyrille Moukendi, MWM's CEO, opted for the MUMPS language, although it was not the most efficient. Mr Moukendi explains that "although not as fast as new languages like Turbo Pascal, it is certainly much more reliable and stable. Indeed, MUMPS is standardized. It is adaptable to any type of computer and allows for later changes in the data processing system." What is more, TOTEM communicates in natural language and requires no data processing knowledge on the part of the user.

The reason Cegedur chose such a system is that the production lines at Issoire turn out some 10,000 varieties of sheet metal and sections annually. Of the total, 40 percent have never been produced before: dimensions, subtle variations

in metal composition, and controls change with each new application. Pierre Chaumes, general manager of the plant, explains: "We have to produce a great variety custom products in small batches; 90,000 metric tons of aluminium are processed annually." Such diversity obliges the industrial engineering department to constantly prepare new production series. In addition, evolving standards and increasing demands by customers multiply the interactions between the rules imposed and the expertise of the metallurgists.

Conventional data processing tools installed in the early 1970's no longer met the requirements. There were several reasons for this: After manual coding of production series. the metallurgists had to call upon two computer specialists to dialog with the computer. The process was very cumbersome, as the program for developing the production series was limited and unable to simultaneously consider all the standards and staff know-how. So the series produced were not necessarily optimal, since the metallurgist was not immune to an inadvertant error (standards would fill an 18-volume encyclopedia and the know-how even more).

Indeed, conventional data processing could no longer manage the library of manufacturing programs. In addition, the program for methods "processing" is not compatible with reorganization plans for the plant's overall dataprocessing program (computer-assisted production management, process control, etc.).

TOTEM solved all the problems in one fell swoop. From now on, no more need for data processing specialists: Each expert communicates directly with the system. He enters the specifications for the order on the screen, and TOTEM produces the manufacturing program in natural language. The system looks up all pertinent information in its database, which is constantly updated by the experts (for whom such updating is now one of the main jobs). It compares the information and arranges it to form the "prototype" series. The speed of its inference engine enables the system to screen the essential elements very quickly without overlooking any (it consults its database up to 1 million times an hour). Production series quality is optimal because no parameter is overlooked, and the time required is much shorter. Today, some 20 series are processed per day. As of next year, the figure will rise to 80 or 100 series per day--or even more. The metallurgists now devote a large portion of their time to the development of new methods.

TOTEM's role does not stop here. Once a production series is developed, it proposes a variety of "cakes" (aluminum ingots from which the rolled stock is produced) by determining the percentage of metal scrap left after the manufacturing process. Production managers are thus greatly assisted in selecting the "right" cake. When the Alpage computer-assisted production control system is operational, this decision will be made automatically.

TOTEM goes beyond methods. Other departments are already inputting their know-how into the system. Its database is being expanded by specialists in packaging, time measurement, and pricing. In these fields, too, TOTEM will make the job easier. For example, next year, when the entire reorganization is complete, TOTEM, using programs previously developed, will consult its database for the time for each operation and will come up with a price estimate.

It will take no more than an hour from a customer's request for a price estimate to submission of a really competitive price for a better quality product.

[Box p 47]

Stages of TOTEM Implementation

At the request of Pierre Dubarry, director of data processing at Pechiney, Cyrille Moukendi, CEO of MWM, produced a model TOTEM expert system with the help of two Pechiney headquarters computer technicians who had a knowledge of metallurgy.

After demonstration of the model at Issoire in 1985, Cyrille Moukendi instructed plant specialists in the operation of TOTEM. They then produced the first full-scale production series. After a month of testing, there was a decision to proceed with the necessary investment and a VAX 750 and three Micro VAX's were bought. TOTEM's real industrial application then began, in close collaboration with MWM, which developed procedures for simple dialogs (tables, identification system, abbreviations, etc.) as requirements arose. Cyrille Moukendi also taught the specialists how to input know-how in simple, concrete terms--a job Mr Moukendi is currently pursuing in the plant's other workshops.

25050/12951
CSO: 3698/A111

FRAUNHOFER, BERLIN INSTITUTES BEGIN 'FACTORY OF FUTURE' R&D

Stuttgart BILD DER WISSENSCHAFT in German Sep 86 pp 15-16

[Article by Leander Hollweg: "Research for the Factory of the Future"; first paragraph is introduction]

[Text] In a symbiosis of fundamental research and applied research, the Technical University of Berlin and the Fraunhofer-Gesellschaft wish to develop the structures of the factory of the future.

It would not have been possible to find a better location. Where the Spree River in Berlin makes a sharp bend, where gray tenements loom next to abandoned turn-of-the-century factories: it is here that a luminously white and futuristic building is the sign of something new.

Its purpose: the development of a new production structure in the factory workplace. "This structure," predicts Prof Dr Guenter Spur, "will be a mechanized organism that, coalesced from individual production cells, is capable of using programmed intelligence to automatically produce goods."

Spur is the head of the Institute for Machine Tools and Production Technology (IWF) of the Technical University of Berlin and of the Institute for Production Facilities and Construction Technology (IPK) of the Fraunhofer-Gesellschaft, whose work has now been combined under one roof. A dual institute with around 300 jobs has emerged for more than DM 135 million.

The two institutes have been linked by a cooperative agreement since 1979. The purpose of this "marriage" is to promote close contact between fundamental research and technical college instruction on the one hand and applied research, with its focus on practical, operational questions, on the other hand.

The new dual institute is marked at the very outset by close connections to industry. Numerous companies donated machinery for the testing range in the round hall, which measures 3,200 square meters in area and is the center of the new facility. The Fritz Werner mechanical engineering factory in Berlin will even be shifting part of its production to the hall.

As a model, the medium-sized company is setting up two complete "processing centers" there. From the computer-supported construction of work pieces, to using computers, to move the material from a modern high-shelving arrangement, to automated production by laser cutters, robots and multi-armed forging manipulators, researchers can in this way study the overall sequence of a real production process and promote the "integrated linkage of energy, materials and information technologies."

The focal point of the research, moreover, is the development of robots that are especially lighter and faster, as well as work with new materials: light metal alloys, coated materials, fiber-reinforced synthetics and technical ceramics.

The scientific program is thus oriented towards a "high-flown" goal: the construction of automated factories in space. "That is the crux of high technology," Prof Spur announced at a March meeting making arrangements for an "Institute for Extraterrestrial Production Technology" in Berlin.

In addition to the unmanned production station in orbit, however, the Production Technology Center will also devote attention to people on earth and to their working conditions. After all, the production structures in the factory have up to now been shaped primarily by a strict and hierarchical division of labor.

In contrast, modern production will, according to Spur, require "technical virtuosos" that "will work like a team." The professor also predicts "that the changes will affect every functional level, from the machine worker to the higher echelons of management." The dual institute is thus set up with an orientation to interdisciplinary cooperation with economists and social scientists.

12271
CSO: 3698/340

FIAT DEVELOPS ROBOT WITH 3D VISION FOR AUTO ASSEMBLY

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 87 pp 44-45

[Article signed M.A.: "Automobile: A Robot Installs 2 Wheels in 48 Seconds"]

[Text] At Fiat in Turin, two Comau robots install the wheels of the Fiat Uno. Hub location is achieved by two-camera 3D vision.

Already massively used for spot welding car bodies, robots are now tackling more complex tasks. They find many applications in the assembly hall. These can be tricky tasks, like wheel installation. This operaiton, which is especially monotonous and tiresome when it is done by hand, proved more difficult that it would appear. Kuka has managed to do it in the FRG for several years, but with so much discretion that there are doubts as to the reliability of the operation. In France, Citroen is working on it for its new Rennes factory. In Italy, Fiat has already taken the plunge. The automatic installation system designed by Comau is working on the assembly line of the Fiat Uno in Turin. It uses two six-axis Smart robots located on both sides of the car body conveyor. The main difficulty is to locate the four threaded holes of the hub into which the four wheel assembly bolts must be fitted. The assembly is located within a volume that is relatively ill-defined in space, due to the lack of precision of the car body position with respect to the three axes. Similarly, the angular position of the hub is unknown. Hence, the use of a 3D vision system calling for two cameras.

Locating the holes is not the easiest task but the hub has two features that are easier to distinguish: an angular positioning stud and a centering cone.

The images of these two elements are detected by the two cameras and analyzed in order to indicate the position of the hub in space to the robot control which is then able to position the wheel so that it will match the two centering studs. The holes in the wheel are then aligned with those in the hub.

The wheels are brought on a conveyor. They already have their caps and their four assembly bolts on.

Note that robotization is made easier by the fact that bolts rather than nuts, are used to assemble the wheels. Nevertheless, the robot grip is still

complex. In addition to the wheel-grasping device, it possesses means to tighten the four bolts. These are provided with torque and angle sensors which precisely control the bolt tightness. That is another advantage of robotization. Since tightening is continuously controlled, it is perfectly consistent. The torque values used are recorded and stored. As far as performance is concerned, the system allows for variations in the hub linear position of + 2 cm along the three axes, illimited angular variations about the axis perpendicular to the assembly line, and + 10 degrees about the other two axes. The robotized assembly cycle lasts 48 seconds for a pair of wheels and the production rate of the assembly line can reach 75 cars per hour, i.e. an average production of 1,125 cars per day for two-shift operation.

9294
CSO: 3698/362

POWERFUL INDUSTRIAL LASER ATTRACTS NORDIC COLLABORATION IN OSLO

Stockholm NY TEKNIK in Swedish 19 Feb 87 p 7

[Article by Christer Kallstrom]

[Text] Oslo--The most powerful industrial laser in North Europe is now located at SI, the Center for Industrial Research, in Oslo. It has a maximum power of 14 kW. It will be a powerful tool for Norwegian technical research and industry.

This is the second piece of equipment containing ultramodern high technology to be installed at Norwegian research facilities in a short period of time. The other Norwegian research organization, SINTEF (Foundation for Industrial and Technical Research at the Norwegian Institute of Technology), recently had its Cray X-MP supercomputer installed in Trondheim.

The new high-power laser represents the largest individual investment in machinery made by SI to date. Like the supercomputer, it is a fruit of Norway's success in oil production. The two machines will be used in the ocean technology industry.

Better Surface Treatment

"Yes, the laser will be used primarily in ocean technology," said project leader Bernt Thorstensen at SI. "Installations in the North Sea are subjected to severe corrosion and wear. By using the laser, we hope to develop better methods of surface treatment and stronger welded joints. The ability of the laser to weld aluminum will also open up new possibilities."

The high-power laser can and will be used in a number of other interesting areas, as well. For the laser, welding, cutting, and surface treatment are branches of the same technological tree. For this reason, SI will examine the interaction between laser beam and material under various conditions.

The new laser will also be used in a Norwegian-Swedish-Danish research project on the surface treatment of materials. Researchers will investigate laser surface treatment with both mathematical and experimental simulation and study the structures and material properties that are produced by this technique.

The purpose of the project is to accumulate knowledge in this area that can later be introduced in Nordic industry. Sweden will be represented by researchers at the Technical University of Lulea, who have been conducting laser research for several years and have a 3-kW laser of their own.

Seeking Nordic Support

Half the funding for the project has already been provided by Nordic research money and an additional 5 million kronor is being sought from the Nordic Industrial Fund.

The SI high-power laser is a gas laser with carbon dioxide as the lasing medium. It has a continuous power of 9 kW and can be used at up to 13 or 14 kW for short periods of time. It was produced in the United States by United Technologies. The total cost of about 7.3 million kronor was shared by NTNF (Norwegian equivalent of STU), SI, and Norsk Hydro.

Apart from the ocean technology industry, a dozen or so other companies including Volvo and Saab have shown interest in the new CO_2 laser.

The automobile manufacturers are particularly interested in experiments with laser welding for assembling car bodies, using both steel and aluminum materials. They are also interested in finding totally new uses for laser technology.

9336
CSO: 3698/320

PHILIPS CHIEF ON EXTENSIVE REORGANIZATION CHANGES

Rotterdam NRC HANDELSBLAD in Dutch 11 Feb 87 p 11

[Article by NRC HANDELSBLAD staff writer Dick Wittenberg: "Major Reorganization at Philips--'No More Old Boy Atmosphere'"]

[Text] The Hague, 11 Feb--Philips is at work on major changes in its internal organization to permit it to compete better worldwide. The traditional matrix approach, where national organizations operated as independent units, has been abandoned. Instead, final responsibility has been given to the product divisions. The number of management levels within the organization will be reduced.

Philips President C. Van der Klugt said this in a talk with the NRC HANDELSBLAD. According to him this represents a "volcanic psychological change within the company."

"There was a time--it's still not entirely past--when the national organizations formed autarkic units," says Van der Klugt. "The products produced in a country were sold in that country. Brazil and the United States are the last of the Mohicans in this respect. But in Europe there is already not a plant that does not work for the organization as a whole. In such a situation you can no longer let policy be determined at the national level. In such a situation strategic decisions have to be taken in a single location: by the product division. It is up to it to provide the products, it is up to it to manage operations. The national organizations must restrict themselves to creating the proper conditions."

Van der Klugt acknowledges that this process is not always without problems. "It calls for a great deal of gentle persuasion, because there's nothing an organization finds as irritating as change. But by now we've captured the psychological barricades."

All Business

The reorganization also means that the number of management levels and support services will be reduced. The product divisions will operate independently. According to Van der Klugt, there has to be an end to the "old boy atmosphere" which so flourished within the company at various times in the past.

Relations should be all business. Furthermore, in the future product divisions will be able to determine for themselves what services they want from headquarters. "Services for which there is no need will be eliminated," says Van der Klugt. "In America with the stroke of a pen, in Europe possibly with a 5-year plan."

Two working groups made up of members of the board of directors and some top managers examined the organization of the divisions last year. The Stand Alone working group under Vice President M. Kuilman studied the divisions which, by the nature of their products, stand by themselves, such as Light and Medical Systems. According to Van der Klugt, it will be up to the board of directors to see to it that these divisions enjoy the benefits of belonging to a large concern and do not suffer the disadvantages, as often occurred in the past. "One of the conclusions is that a great many decisions should be made at a lower level," says the president of Philips.

The Interlinked working group, which was chaired by Van der Klugt, studied the divisions which are closely interconnected. These divisions should work much more closely together, the working group concluded. Special cooperative links will be set up to ensure this.

12593
CSO: 3698/352

FRG: TOSHIBA MEGACHIP PROJECT IN BRAUNSCHWEIG

Rijswijk PT/AKTUEEL in Dutch 11 Feb 87 p 3

[Article by Bart Stam: "Braunschweig Becomes Center of Japan's Megachip Project"]

[Text] Toshiba, the Japanese electronics company, is going to produce 1-megabit chips in Braunschweig, West Germany, on a large scale. These will be memory chips of the DRAM type (Dynamic Random Access Memory). In the first 3 months of this year production is planned to reach about 100,000 a month. Between Braunschweig and Japan, where Toshiba now produces some 500,000 DRAM chips [monthly], the company wants to achieve a total production of 1 million 1-megabit DRAM's a month by March of this year.

Tsuyoshi Kawanishi, vice president of Toshiba Corporation and head of the semiconductors division, and Akira Nakaji, head of Toshiba Semiconductor GmbH, announced in Braunschweig that Braunschweig will be an important European bridgehead for Toshiba. The firm already has design centers for advanced chips in Neuss, near Dusseldorf; Frimley Camberley (London); and Stockholm. In the semiconductors field Toshiba is most involved in producing MOS memories, MOS logical integrated circuits, bipolar circuits, and discrete components.

In Europe the Japanese company is working with Italy's SGS Micro-elettronica to develop CMOS wafer processing and CMOS logic products.

Last June Siemens, the West German electronics firm, and Toshiba signed a technology agreement for the development of Mb DRAM chips. As regards production, however, each of the two multinationals is on its own. Within the West German-Netherlands Megaproject, Siemens is developing a 4-megabit DRAM and Philips a 1-megabit SRAM (Static Dynamic Access Random chip [sic]). The Japanese point out that the structure of their own chip measures 1.2 microns. Siemens' megachip is submicron in its dimensions, namely 0.7 micron.

Toshiba's chip has an alphanumeric memory of over 130,000 characters, the equivalent of four typed A4 pages. The 1-megabit DRAM is the successor to the 256 kilobit DRAM, of which the firm has now produced 3 million. According to Kawanishi, Toshiba is already far along with the development of a prototype 4-megabit DRAM. The next stage will then be a 16 Mb DRAM. That is why the

company, which in its own country has already passed its competitors Hitachi and Mitsubishi in the field of semiconductors, will spend roughly half of its total R&D budget on these technologies.

Interest

Toshiba Semiconductors GmbH's Braunschweig plant opened in December 1982. Since its opening it has already produced 2 million 64K and 256K DRAM's and various SRAM's. In 4 years the number of employees has doubled from 100 to 200.

This is reason enough for Lower Saxony's Minister of Economic Affairs Hirche (CDU) to be pleased with the Toshiba plant in Braunschweig. It is true that Lower Saxony had to reach deep into its pockets to attract Toshiba because the plant was granted a subsidy of DM4 million. But Hirche says that the money will certainly be earned back in the long run. He expects the number of employees to grow as Toshiba expands the plant. The minister adds that the arrival of Toshiba has caused other electronics and computer companies to show interest in setting up in Braunschweig's industrial park and that negotiations are quite far along with several. Hirche also sees advantages for Braunschweig's Technical University, which is already working with Toshiba.

12593
CSO: 3698/350

NORWAY: SINTEF RESEARCH CENTER SERVES 5,000 PROJECTS YEARLY

Helsinki HUFVUDSTADSBLADET in Swedish 22 Feb 87 p 14

[Article by Nina Sandas]

[Text] "Research Before All"--that is the motto of the SINTEF group in Trondheim. SINTEF, or the Foundation for Industrial and Technical Research at the Norwegian Institute of Technology (NTH), is the largest technological research center in North Europe.

The institute has about 2,000 employees, about half of whom are researchers, and an annual income of almost 1 billion Norwegian kroner.

The center deals with about 5,000 projects each year, mainly research that is commissioned by business, industry, research councils, and public agencies.

The foundation, which is based on the not-for-profit principle, was established in 1950 to stimulate closer cooperation between the academic research institutes and businesses.

SINTEF is closely linked to NTH. Laboratories and equipment are used by both institutes. SINTEF employees participate in NTH training and NTH instructors are often project leaders at the various research institutes.

This cooperative model has yielded results that are widely known and that have been of great economic value even beyond Norway's boundaries. It may be justifiably claimed that the original intentions have become reality. Developments have been especially rapid during the 1980's.

At the same time, this research environment in Trondheim has spawned many new companies and jobs. During 1984 and 1985 about 30 new companies were formed in the Trondheim region as a direct result of advances by SINTEF researchers. Researchers have gone out and become executive vice presidents themselves.

Research Tied To Economy

"We call SINTEF a technology department store where companies and others can purchase technology and special know-how," said SINTEF director Johannes Moe.

Of last year's budget of over 900 million kroner, about 75 percent came from business contracts. This makes SINTEF the largest Nordic research institute that is financed with private funds. Johannes Moe admits that this can have its disadvantages, since volume is closely tied to the economy.

Last winter director Moe stated his opinion on the forces of capital, which he claims are on a collision course with the needs of technology.

Norwegian business is being ravaged today by extremely impatient money and investors, who are only looking for short-term transactions on the market, while necessary long-term investments in research and technology are being neglected.

In addition, there was the drop in oil prices last year that was so devastating to Norway.

For the SINTEF group, almost 40 percent of which is financed by the oil business, this resulted in less business. Certain institutes within the group were affected more than others. As an example, the Research Institute for Marine Technology (MARINTEK) cut its personnel from 255 to 200 employees because it received fewer contracts.

Now the picture is brighter and SINTEF does not fear additional reductions in manpower during the present year. "I believe that, despite everything, what happened was enlightening and positive for Norway in the long run. This is also true for us here at SINTEF, since we were forced to shift gears and to try even harder. Costs in the offshore business were too high and the oil companies have had to pay for their mistakes. They will not go back to the same technology they used before the drop in oil prices. Now it is important for them and for us to develop new cost-saving methods and technologies," Johannes Moe said.

Miracle Beads

Although the name SINTEF is most closely linked to the oil business, the research institute has a broad range of activities. Information technology holds a prominent position. Biotechnology is coming into the picture more and more. SINTEF entered the fish breeding industry several years ago. It has now achieved some promising results with plaice and other species. Medical research is also conducted here. The totally unrelated field of traffic research is yet another area of special interest here.

One of the greatest achievements of the SINTEF group is the so-called miracle beads developed by chemistry professor John Ugelstad of NTH.

These plastic beads, called monodisperse polymer particles in the technical jargon, are all just as round and just as large--or small, since they are 1/5,000 mm--as all the others.

Eventually the plastic beads, to which medication is added, will be used to treat various forms of cancer. Successful experiments have already been

conducted. The particles have the ability to distinguish between healthy and sick cells. The cells that are attacked can be brought out of the bone marrow by magnetism.

The Ugelstad beads are being used for more and more purposes. They are now being used in various purification processes in industry. SINTEF, which holds the rights to this process together with the DYNO Concern, makes no secret of the fact that the beads could be worth billions within several years.

Professor Ugelstad has won several international research prizes for his discovery and it would come as no surprise if he were to receive a Nobel Prize for his discovery in the field of medicine.

One invention that may not be of such universal interest is a fireproof computer cabinet that is already in production and will be installed at all Hilton and Sheraton hotels throughout the world.

Billions In Savings

Just a few weeks ago SINTEF presented the preliminary but extremely promising results of yet another research project that will have a positive economic effect.

The oil industry will save billions when the problem of so-called multiphase transport, the transport of oil and gas in the same pipeline, is solved. Since 1982 SINTEF has been working with the Institute for Energy Technology and this research group has made more progress in multiphase transport than any other group in the world. The new technology, which has been tested at a large-scale model facility in Trondheim, will reduce costs by 30 to 40 percent, compared to oil and gas transport systems used today.

Multiphase transport (also called two-phase transport) means that gas and oil can be transported directly to land from the ocean fields. The production and processing facilities can then also be placed on land, rather than on the expensive platforms at sea as they are now.

New possibilities recently opened up for SINTEF with the signing of a valuable contract between MARINTEK/Ocean Laboratory and the European space organization ESA (European Space Agency). Initially, MARINTEK will study the requirements for carrying out tasks, such as making installations, in space. As we know, weightlessness in space is comparable to the underwater state. The large pool at MARINTEK, which is unique in that the depth of its bottom can be varied from 0 to 10 meters, may be used later to simulate the zero-gravity state for astronauts and for remotely controlled operations.

This year, most of the contracts at the Ocean Laboratory are related to shipping, while the offshore industry is still cautious with model experiments and contracts.

Nevertheless, for several years now Finnish companies such as Wartsila/Valmet, Hollming, and Rauma-Repola have commissioned numerous studies by the Ocean Laboratory in Trondheim.

The 50 x 80 meter pool is used for model experiments with all types of marine vessels and installations. Ocean currents and waves up to 30 meters can be simulated here, depending on the scale of the model.

SINTEF's latest pride and joy, the CRAY X-MP/24 supercomputer, can make such current calculations with unbelievable speed. This machine has been in operation since 1 February and it was officially dedicated last week by Crown Prince Harald.

The supercomputer will serve SINTEF researchers and researchers at the other Nordic universities, which are linked to the machine, for all types of large-scale calculations.

The CRAY X-MP/24 computer, which is the most powerful computer in the Nordic countries, was purchased through a joint economic effort by SINTEF, NTH, the two research councils in Norway, Norsk Hydro, and Statoil. The purchase and operation of the machine will cost about 150 million kronor over a 5-year period.

The CRAY machine operates around the clock and its capacity will also be sold to outsiders.

Swedish companies have already expressed interest in purchasing SINTEF computer services.

The SINTEF group itself will have many valuable applications for the super-computer projects such as modeling and simulating oil and gas reservoirs, making seismic studies, modeling currents, calculating loads on marine installations, making meteorological studies, and much more. The possibilities are almost unlimited. This machine carries out operations in 3 minutes that previously took 10 hours, according to project leader Bjorn Pettersen.

Gas Research

Another major effort recently presented by SINTEF is a research program on the possibilities of utilizing natural gas in Norway.

This year the SINTEF group has just over 10 million kronor at its disposal, but the entire program will cost about 100 million kronor and last for 6 or 7 years. The goal of the research program is to build up Norwegian know-how and to improve existing technology for converting natural gas to liquid fuel (such as gasoline) and to liquid natural gas (LNG).

The third subproject involves the use of natural gas for electricity generation.

Many interested parties are already trying to get in on the ground floor, i.e. they want to be ready when the green light is given for the recovery of the major gas and oil deposits in Haltenbanken near Trondelagen. It already seems clear that an enormous gas-fired power plant will be constructed near Trondheim in the early 1990's.

Wants To Expand

Thus, the SINTEF group already has many irons in the fire. Now, however, the research institute wants to expand its territory outside Norway. Just last week, with a great fanfare and flourish, the group exhibited its services in Sweden, which it hopes to make into a new domestic market. The campaign was kicked off at the prestigious Academy of Engineering Sciences in Stockholm, where SINTEF arranged a large seminar.

The group will make a systematic effort to win contracts in Sweden and its goal is a fivefold increase in revenues over a 5-year period.

SINTEF know-how will fill several technological gaps in Swedish industry and, conversely, cooperation with Sweden will provide the group with new proficiency.

"We will try even harder to bring about Nordic cooperation in research. Individually, we are so small that it is an advantage to all of us if we each utilize the resources and knowledge of the other. This, in turn, could lead to greater industrial cooperation in the Nordic countries," said SINTEF director Johannes Moe.

9336
CSO: 3698/320

FUNDS FOR TECHNOLOGY STIMULATION IN NETHERLANDS

Commission Proposal

Rijswijk PT/AKTUEEL in Dutch 11 Feb 87 p 3

[Report by KC: "Support for Technological Development of Companies"]

[Text] Minister De Korte of Economic Affairs wants to help medium-sized businesses as much as possible to participate in the European technology programs. He said that recently in a discussion on the European technology policy with the permanent Second Chamber Commission for Economic Affairs. There had been pressure from the commission to also involve precisely the small, specialized companies in the various research programs and to remove existing obstacles.

De Korte does not want to support the preliminary expenses financially. He thinks that those expenditures are part of the individual responsibility of companies. According to the minister, the companies will primarily have to utilize already existing channels. In that respect the National Industrial Service (RND) has a task. The department will investigate whether the communication office of the EC, the so-called liaison bureau, must be strengthened.

In the meantime De Korte did not react negatively to suggestions for private financial support for participation in EUREKA research programs. He promised he would look into that matter. He reacted positively to the idea of establishing a European telecommunication agency in Europe. He supported a CDA plea for reinforcing Dutch embassies with (for example) technical-scientific attaches, some of whom have already been working there for many years.

Warning

Already earlier, representatives of Dutch industry had emphatically stressed that the Second Chamber should do everything in its power to guarantee continuation of the EC programs. In a hearing, especially the multinational companies warned that, if the stagnation in Brussels were to continue, the big European countries would go their own way. For a small country such as ours, that would entail disadvantages.

The 12 EC countries thus far were unable to agree on the amount to be set aside during the coming 5 years for technology programs such as ESPRIT, RACE and BRITE. The European Commission came with a proposal of 10 billion ECUs (European Currency Unit, worth almost 2.50 guilders). Later it reduced that amount to 7.7 billion. The "big ones," however (France, the Federal Republic of Germany and the United Kingdom), still find it too large. The Netherlands has tried to present a compromise proposal of 6 billion ECUs.

The Dutch companies warned the Chamber that with this development the objectives of the programs are being threatened. Philips especially is very involved in this matter, because the concern participates in 55 projects. But also smaller companies in the area of electronics and software, and technological institutions such as TNO [Netherlands Central Organization for Applied Natural Scientific Research], expressed words of warning.

Nevertheless, Dutch participation in the European technology programs appears to be considerable. According to a spokesman of the Dutch liaison bureau for industry, with respect to all programs more money comes back from Brussels to the Dutch companies than what the Dutch Government must contribute according to the distribution code.

Over 80 Million Pledged

Rijswijk PT/AKTUEEL in Dutch 11 Mar 87 p 3

[Unattributed Report: "New Approach by Economic Affairs for Technology Subsidy Companies"]

[Text] Minister De Korte of Economic Affairs last week established four areas over which the available budget for technology stimulation will be distributed. For companies, 80.6 million guilders is available, which will be distributed in a different way from what was customary until now. Over 155 million guilders is for information, the recruiting of foreign investors, education, and technology research programs already on the way. The announcement in the Gazette was accompanied by the emphatic statement of the minister that the entire regulation is only of a temporary nature while awaiting the advice of the Dekker Commission.

Programmatic stimulation of industry-targeted technology is what the Department of Economic Affairs calls the interim regulation for technology subsidies for 1987 to companies. Compared to previous years, it contains rather drastic changes. Four areas have been established in which subsidies can be requested: information technology, biotechnology, materials technology and medical technology. In these areas national programs have been developed with an operating period of at most 4 years. The objective is to stimulate research in areas with opportunities for Dutch industry. A total amount of 236 million guilders is available for that. By far the largest part is intended for information technology (168 million guilders). Biotechnology, materials technology and medical technology must manage with considerably less (18.5, 37.5 and 12 million guilders respectively).

Of that amount, 80.6 million guilders is intended for industry via the so-called programmatic stimulation of industry-targeted technology. From now on companies can receive subsidies only for feasibility studies, new research projects and demonstration projects with a pilot operation.

Patterned after the research programs of the European Community, the available funds will be distributed according to the so-called tender system. For each program, the opportunity to submit applications will exist for a limited period (about 3 months). After the termination of this period, all projects will be compared to each other by an external body of experts. A ranking will be made of the projects which meet the conditions of the regulation. On the basis of it, subsidies will be granted to those projects which best meet the objective of the regulation, until the budget is used up. The department of Economic Affairs thinks that with this it has devised a more objective decision making process which is more understandable to the applicants. Moreover, due to the new method, mutual competition will be greater, the chance that only the very best projects are funded will increase, and projects no longer will be left out merely because the subsidy pot is empty.

Budget

Until now, projects were treated "chronologically" in the granting of subsidy, which meant that it was done on the basis of "first come, first served." Of the amount available for companies, 41 million guilders is intended for information technology, 12 million for biotechnology, 20 million for the development of new materials, and 7.5 million for medical technology.

Companies can get a maximum of 45 percent of the project costs reimbursed. The subsidy amounts are linked to maximum amounts per company. For feasibility projects it is 250,000 guilders, for research projects 20 percent of the total available amount, and for demonstration projects 500,000 guilders.

The projects submitted must meet a number of formal and substantive criteria. Feasibility projects must be "original and offer perspective" for the Netherlands. Research projects must be demonstrably new for the Netherlands and have a considerable chance of success. Demonstration projects must carry technical and/or economic risks and have sufficient pilot operation.

With the new approach to technology stimulation, Minister De Korte carries out some elements of the government declaration in which it was stated that the coherence, effectiveness and objectivity of the re-industrialization policy will be strengthened, that projects will be judged by external experts, and that outside of the framework of the programs no support will be given any longer to individual business projects in the area of technology.

(Economic Affairs has printed a brochure on the industry-targeted part of the technology aid. It can be requested from the Information Bureau of the Department of Economic Affairs, Postbus 20101, 2500 EC Den Haag, telephone 070-796325)

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CSO: 3698/351

NETHERLANDS: 1 MILLION FOR BRITE MATERIALS R&D

Rijswijk PT/AKTUEEL in Dutch 21 Jan 87 p 3

[Text] The research of the Eindhoven TU [Technical University] into new materials for use at high temperatures will be subsidized by 1 million guilders by two companies and the EC. The research will cost a total of 2.5 million guilders. Of that, 1.5 million will be to the account of the university, 0.5 million will be paid by the EC in the framework of the BRITE program which is aimed at basic research in the area of industrial technologies. The remainder will be paid by the Ansaldo company from Genoa and the Xycarb company from Helmond. Ansaldo is part of the heavy industry in Italy and supplies, amongst other things, electric power plants. Xycarb manufactures specialized tools for the semiconductor industry.

At the Eindhoven TU, research has been done for a number of years already on materials suitable for use at high temperatures. That is done partly because at high temperatures the efficiency of heat conversion processes is usually higher. The research is particularly directed at improving the efficiency of a flame-heated thermionic energy converter. That is an apparatus with which heat is converted directly (without moving parts) into electricity. Such a converter consists of two electrodes of which one is heated to 1400 C while the other one is cooled to 600 C. The hot electrode emits electrons which are captured internally by the "cold" electrode. That creates a difference in voltage that can be loaded externally. Such converters are utilized in places where heat is produced at a high temperature for use in relatively low temperature processes, such as in generating stations. As a topping system, the converters can improve the efficiency of these generating stations. Another possible application lies in the sphere of thermal energy coupling.

The flame-heated thermionic energy converter puts such high demands on the materials to be utilized that existing materials are unsuitable for it. For example, it must be corrosion resistant at 1450 C, it must be a good thermal conductor, sufficiently strong, and it must not show any creep at 1400 C under mechanical load. In order to meet these characteristics, the TU in Eindhoven is working on the development of composite materials. The high-temperature composite materials in this project consist of multi-layered materials and

metal-ceramic bonds. According to the EC, the development of those types of materials fits excellently into the BRITE program which is intended to strengthen Europe's competitive capacity.

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SWEDEN OFF COCOM BLACK LIST, NOTES LIST SIMPLIFICATION

High Tech Export Cleared

Stockholm NY TEKNIK in Swedish 19 Feb 87 p 3

[Article by Mikael Holmstrom]

[Text] On Wednesday 4 February, the United States government finally removed Sweden from its list of risky countries that smuggle technology to the East.

A secret document sent to President Reagan's National Security Council justified the removal by pointing out that last year Sweden introduced export controls for technology from the West.

Representatives of the American government revealed this to NY TEKNIK.

Sweden was placed on the list of smuggler countries in 1984, following the "container affair." Since then, the Pentagon has conducted additional examinations of business deals involving the sale of advanced high technology to Sweden. Without Pentagon approval, the Commerce Department of the United States has been unable to grant the necessary export licenses.

Late last year Pentagon officials indicated that Sweden had been removed from the list (NY TEKNIK, 1986:47). But this information was premature. The matter was taken to the White House and President Ronald Reagan's National Security Council (NY TEKNIK, 1986:50). The uncertainty concerning Sweden's status was aggravated by the fact that both the criteria for the list and the names of the 15 countries on the list are actually secret.

Now, however, representatives of the American government indicate that the removal of Sweden from the list is "final." This final removal is confirmed in a secret letter from the United States Commerce Department to the National Security Council of the United States. According to what NY TEKNIK has learned, the letter, dated 4 February, states the following:

"Effective immediately, Sweden is removed from the list of countries for which examination by the Defense Department is required for export licenses."

It has been learned that it was the Pentagon that recommended removing Sweden from the black list. That occurred last summer when the Swedish government

introduced export controls for high technology from the West. The Swedish controls apply to technology from the so-called COCOM countries (Japan plus the NATO countries, except Iceland).

The Commerce Department also justifies the removal of Sweden by pointing to the new Swedish controls, which it describes as follows:

"The steps that the Swedish government has recently taken to tighten its controls over COCOM-controlled products and technology."

The letter from the Commerce Department is signed by Undersecretary Paul Freedenberg.

Paul Freedenberg refused to comment on his letter, indicating that all aspects of the black list are secret. He did not deny its existence, but stated the following:

"I can say that Sweden has been given high marks in recent months and we believe their export control system is working well. This is reflected in better treatment, in general. I can say no more."

At the Swedish Foreign Ministry, Undersecretary Carl Johan Aberg said that the government had received no official word from the United States indicating that Sweden had been removed from the list. He did not know if the Swedish government would ever receive such information.

The goal of the Swedish policy is for the United States not to discriminate against Sweden. Sweden's removal from the list is a step in this direction: after receiving special treatment, Sweden has now achieved a "normal position" that is comparable to the position of other neutral countries.

But Swedish companies are still at a disadvantage, compared to their competitors in Norway, West Germany, and Great Britain, for example. It is more difficult for them to obtain controlled technology from the United States and it takes longer for them to obtain it.

The Swedish government has gone a long way toward, as they say, "securing the availability of foreign high technology." It is not a "given" that Sweden will obtain such technology. Just after the container affair in 1983, the United States temporarily blocked high tech exports to Sweden. Sweden was then placed on the list of "smuggler nations."

In 1984 the government directed Swedish customs officials to stop technology smuggling, but Sweden lacked effective legislation. This was pointed out by American politicians in the spring of 1985.

The Americans sent this same message to other neutral countries and, finally, Sweden remained the only one without export controls. Sweden was a hole in the "technology wall" to the East that the West had built up in the form of export controls.

More cases of smuggling and more American demands made the situation untenable. At Olof Palme's last cabinet meeting on 27 February 1986, the government decided to introduce Swedish export controls. These controls apply to foreign high technology and, in practice, they control Western technology sent to the East.

Not unexpectedly, there was criticism from Moscow and praise from Washington (NY TEKNIK 1986:30-31). The official Swedish line is that Sweden is conducting no direct negotiations with the United States. As recently as December 1986, however, Swedish delegations made it clear that Sweden now deserves better treatment by the Americans. The removal of Sweden from the list may open the door to other changes in Sweden's position in the future. This has already been indicated (see article below).

Sweden Gets 'Gold Card'

Stockholm NY TEKNIK in Swedish 19 Feb 87 p 6

[Article by Jan C. Aschan]

[Excerpts] New York--The American Commerce Department is proposing relaxation on a number of points in its export controls for high tech products.

If the proposals are actually approved, there will be three changes directly affecting Swedish companies. State-owned Swedish companies (such as FFV--National Defense Manufacturers) could obtain technology freely--the so-called gold card. Some items that contain only parts and components from the United States would not be subject to controls. Finally, companies that already have a distribution license could use it for exports to China, although they would first have to indicate who the Chinese recipients would be.

9336
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BULGARIAN COMPUTER DEVELOPMENTS SUMMARIZED

Paris ZERO UN INFORMATIQUE in French 2 Mar 87 p 28

[Article by Josip Rajman: "Bulgarian Data Processing: Personal Computer Has Priority"]

[Text] In 1963, the Bulgarian Academy of Sciences developed its first Vitosa computer. Thereafter, between 1966 and 1971, Bulgaria produced hardware of the Facom 230-30 type in cooperation with Fujitsu in Japan.

In 1969, with the creation of the USEC (Asterisked Footnote) (Unified System of Electronic Computers (also known as EC, Ryad, Eser)) by COMECON, Bulgaria was given responsibility for production of the EC1020 system, with a memory capacity of 64K to 256K bytes. Production started in 1972 with the support of the USSR. This system was followed by the Model EC1022 with a 512K memory, then by Model EC 1035. At the present time, an improved version, with 16M bytes of virtual memory, is still in production, still in cooperation with the Soviet Union.

Office equipment is presently being produced by 14 plants in cooperation with four scientific institutes. Concurrently, not less than 120 plants pertaining to different branches of industy manufacture electronic components and parts.

Local Networks Permitting the Setting Up of Databases Accessible by PC's

Priority is now being accorded to personal computers and to local networks, which are to be put in place between now and 1990 to enable the accessing of databases. Microelectronics is sure to play an important part in this production effort.

The first Bulgarian personal computer, the Imko, was developed in 1980, and was followed in 1982 by the Imko-2. The first 8-bit model of the Pravets series appeared in 1983, with high- and low-resolution color graphics. The 16-bit model, with 256K to 640K of RAM and 40K of ROM, is being mass produced since the beginning of 1986. It can run software designed for the IBM-PC, floppy disk drives and Winchester drives. By connecting it to special terminals, it can also be used for controlling industrial processes. It accepts the Cobol, Fortran, Basic and Pascal programming languages.

An IBM-PC/XT-Compatible Super 11 With up to 640K Bytes

The latest model of Bulgarian PC, the (16-bit) Super 11, is fully IBM-PC/XT-compatible. It is based on the Intel 8088 microprocessor, can offer 256K to 640K 8-bit bytes of memory, and includes one floppy disk drive and one 10M disk drive.

Worthy of mention also are some of the other central units currently in production. The Isot 1016 M1 is PDP-11/34-compatible. The Isot 10310, a general-purpose microcomputer, handles the Roman and Cyrillic alphabets, various peripherals, and local networks, and can be integrated into a large system.

The Isot 1015 C is a "point of sale" system that can support up to 16 cash register terminals equipped with automatic label readers.

The EC 9005 is a multiple-console system equipped with 252K bytes of memory, one or two 29M disk drives, one or two tape decks, and one printer.

The EC8566 cluster of keyboards and screens includes up to seven printer and video terminals, a light pen, and a magnetic tape reader, and utilizes the virtual machine environment method of communications access.

As regards peripherals, the most recent in the line of terminals, the CM 1604 M3, offers a VT 125 scrolling-display screen and a standard ASCII 96-character keyboard. Bulgarian (80 c/s) and Diablo-type (30 c/s) dot printers for the printing of 80-character lines can be had. Also available are two models of plotting board, one of which is connectable via an RS 232 interface; the other, a mini-plotter, is designed especially for its Pravets line of computers.

Several data carriers are manufactured in Bulgaria. These include two small mini-disk drives weighing only 2 kg, 5-and-1/4-inch and 8-inch floppy disk drives of various densities (up to 1M bytes per side) and disk drives compatible with IBM loading routines. Other models of tape deck for tape densities of 32 or 63 bits/mm are manufactured in accordance with ISO 3788 and ISO DP 5652 standards. Some have automatic loading, which lightens the burden on the operator. Their speeds range between 25 and 45 inches/second, and they are compatible with Ampex and Pertek equipment.

Bulgarian software holds its own very well. In addition to the customary accounting and statistical programs, it features a good personnel management system, with capabilities for graphic representation of data, CAD/CAM software for personal computers, and educational softwares.

Classification of Tobacco Leaves According to Their Color

Highly regarded as agricultural and horticultural experts, the Bulgarians have designed original softwares in these domains--for example: A system for the complete monitoring of all the environmental factors and parameters of

a greenhouse, which are assimilable in less than 1 hour of an agronomist's time; and a program for classifying tobacco leaves according to their color, exactly as it has been done manually for centuries past.

Bulgaria exports numerous items of office equipment to some 50 countries, such as typewriters, ranging from portables weighing 4.2 kg to 18-cps daisy-wheel models weighing no more than 17 kg, the weight of an ordinary mechanical machine. The Hebros 300-L electric model weighing 7 kg is among those most in demand. Its line of cash registers ranges from simple models for supermarkets to large systems with memories capable of storing over 300 items and their prices, and 456 postings of 8 accounts for warehouses and restaurants.

9238
CSO: 3698/360

HUNGARY: COMPANIES COMPETE FOR COMPUTER APPLICATIONS FUNDS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 7

[Article by K. M.: "OMFB Competitions 1986; 75 Percent Success in G1"]

[Text] Ever more frequently competitons are used to select the most suitable of those applying for tasks designated in the National Medium-Range Research and Development Plan (OKKFT). The advantages of the competition system are, among others: it creates a competitive situation, so the entries promising the most efficient solution get the commission; it expands the circle of participants; it mobilizes resources; and it increases the openness, the moral purity, of the distribution of state resources.

Although the competition system cannot be used for every theme the advantages offered by competitions were used at the beginning of the plan period in the OKKFT G1 program titled "Computer Technology, Communications and Automation R&D Tasks For Electronification." At the beginning of 1986 the G1 Program Office of the National Technical Development Committee (OMFB), which coordinates the work, announced four competitions, aiding in this way implementation of the program the 5-year budget for which is made up of 3.5 billion forints from the central technical development fund, 0.5 billion from budgetary contributions and 5-6 billion from enterprise contributions.

The four competitions announced have closed and have been evaluated. The first year closed with 75 percent success; that is, entries meeting the competition specifications arrived for three of the four competitions. The goal of the fourth competition was development of a letter quality printer for mini and microcomputer systems, preparation of a prototype, testing it and preparing for manufacture.

The OMFB trusted that it could scare the rabbit out of the bush, that is bring to the surface a domestic development of this sort as yet unknown, or provide incentive for starting. Well, the rabbit didn't jump out because he wasn't there. Two entries did arrive by the time limit but neither satisfied the specifications.

On the one hand they did not meet the conditions technically; that is they were not plans for a printer which could be used on mini and microcomputers. And on the other hand--a direct consequence of this--they did not meet the requirement in price either. They proposed equipment with a price well exceeding the price of 30,000-40,000 forints.

And although they did not win in the competition the plans of the two were not thrown away at the OMFB; they continue to study the content and talk with the entrants. Their developments may offer a technically better solution than existing ones in the category of matrix printers.

One can conclude from the competition that not even experts agree on what to call letter quality; they were seeking a solution in "overwriting" by matrix printers.

There were many entrants for the other competitions. On the basis of the opinion of impartial juries (e.g., people from a firm entering the competition could not be members of the judging committee) the G1 Program Office of the OMFB has already signed contracts with institutions and enterprises worthy of it.

Fifteen of those competing in "Development of Computer Technology Applications Model Systems Which Can Be Widely Used" will receive central support (see Table 1). On the basis of these contracts they can do their work with 26.4 million forints from central sources and 35.7 million forints from their own sources, and must complete the work by the end of 1987. The contracts contain the size and repayment time of the OMFB support, which represents a maximum 50 percent of the developmental work.

Eight enterprises or institutions won central support in the "Computerized Industrial Expert Systems" competition (see Table 2) with similar conditions. Here they can count on 23.4 million forints in central sources and 23.8 million of their own sources.

In regard to an optical page reader the specifications set the time for completion of the developmental task at 2 years. In contrast to the foregoing the maximal support which can be given here can reach 60 percent of the developmental work. Within OMFB support the total for R and D investment cannot exceed 50 percent of the OMFB support. Here also the magnitude and time of repayment are fixed in the contracts.

Contracts were signed with two contestants for the development of optical page reading equipment which can be connected to personal computers or text processing systems and is suitable for reading A/4 format documents which are printed or typed. These were the SZKI [Computer Technology Research Institute and Innovation Center] and the agricultural machines operation faculty of the Agricultural School of the Godollo Agricultural Sciences University. (Central support will come to 7.9 million forints; their own resources will come to 8.3 million forints.)

Table 1. Works Accepted in the Competition "Development of Computer Technology Applications Model Systems Which Can Be Widely Used"

Entrant	Theme
Hajdu-Bihar County Auto Service Small Enterprise	"Service '86"
State Administrative Computer Service of the Central Statistics Office	A microcomputer legal information system
Elzett Works	Development of complex microcomputer data processing systems for small and medium enterprises making bulk metal articles
North Plan Miskolc	A "raster plus" 2 + 1/2 dimension drawing, editing, designing system
VORG Development, Organization, Service Subsidiary	Determination of dressmaker's norm time and production guidance and control
Industrial Operations Faculty, Budapest Technical University	Informatics support for innovation management activity
Heavy Industry Technical University, Miskolc	Development of a microcomputer program system suitable for deep drawing technology and tool design
Construction Management and Organization Institute "Innova" Organizational Subsidiary	Development of microcomputer programs supporting operational resource management and business policy on the basis of a production guidance system
Semmelweis Medical Sciences University	Online computer data management system to improve pre and perinatal services
Computer Technology Applications Enterprise	Program system for an IBM PC computer providing optimal in-plant machine-product set-up
Ministry of Health, Organization, Planning and Information Center	Microcomputer model of a district medical information system
Ikarus	Small computer model system for assembly line production guidance
Tisza Volan Novarat Elektronika	Computer information system for programmed production guidance of highway transportation
Road and Railroad Planning Enterprise	CSATESZ (Channel planning with an electronic computer)
Hungarian Academy of Sciences, Technical Chemical Research I.	An expert system, on an IBM PC, for determining guidance parameters optimizing energy consumption of continuous furnaces

Table 2. Works Accepted in the Competition "Computerized Industrial Expert Systems"

Entrant	Theme
Architectural Institute	Development of an expert system aiding construction industry planning and supporting the National Construction Code
Ikarus	Optimal design of manufacturing systems
Construction Management and Organization Institute	Development of an expert system for value analysis technical-economic planning of building structures
Compudrug	Resource planning expert system for chemical industry plants
Instrument and metrology faculty (MMT) of Budapest Technical University	Development of a framework system making possible creation of technological expert systems
Geofizika	Expert system for raw material prospecting
GIT of Budapest Technical University	Development of industrial model systems with aid of artificial intelligence methods
Iron Industry Research Institute	Creation on an IBM PC/XT computer of an expert system to plan steel selection and heat treatment technology

8984
CSO: 2502/28

HUNGARY: SMALL COOP CORRECTS SLOPPY ONLINE NETWORKS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 2

[Article by Tamas Kolossa: "It Is Necessary To Test"]

[Text] In September it was one year since the formation of the X-Byte Small Cooperative, and for this year they are planning trade of 5 million forints. It may be that the sum does not seem large at first glance, but one must immediately add that they are not selling clones. They only undertake such apparently small jobs as, for example, building computer networks. It is worth summing up their experiences of one year.

"We are witnessing today a spread of online networks," says president Akos Nagy, "and as one could scare a user with the word 'computer' before the C-64 so strange things are happening now under the veil of 'network.' The majority of those undertaking to set them up belittle the requirements of installation so often do not notice that the computer system is unreliable because of the mass of patched-up cables. It is curious but they even do what a simple electrician would not allow--extend the cables piece by piece. Planning an installation is virtually an unknown concept, so they do not even steer clear of such obvious danger sources as a transformer. And then they neglect to measure the bit errors."

It is true that today there is not yet a perfect domestic instrument for this. The only one, the Orion device called Datest, is not good everywhere and for everything. Another instrument has been shown at Orgtechnik but for the time being in an initial state. According to experts one would need an enterprise at least the size of Videoton for series manufacture of a good quality, suitable instrument.

There are fewer of them today but there are still people who take advantage of the ignorance of customers and build XT type machines into a terminal network. Users beware: Although the XT has a V.24 output it is a slow machine with only one microprocessor; real multi-user systems cannot be made out of it without a significant increase in response time!

There are even more sources of error in the case of local networks. One must be very careful with coaxial cable; it must be laid carefully without break, damage or patching. One finds even fewer test instruments, so portable

versions should be developed as soon as possible. The X-Byte coop will undertake testing, with a guarantee.

The members of the X-Byte Small Cooperative have already corrected the sloppy work of others in a number of places. But they have also installed a number of networks independently in a way unusual in the trade--with a 2 year guarantee. Their secret is simple--honest, careful work.

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ELEKTRONMAS EXHIBIT IN MOSCOW REVEALS GAPS IN EMBARGO

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 9

[Article by Pal Reti: "Elektronmas '86; Gaps in the Embargo"]

[Text] If someone wants to copy a circuit chip or other microelectronic part it is in vain that he studies an example of it, disassembles it into its most minute parts or studies it under a microscope. He will not get very far with it. Without obtaining and mastering the technology it is impossible to reproduce the part or make a similar new one. This puts the firms dealing with the production of the manufacturing equipment used in the microelectronics industry in an indisputably advantageous position.

The above, however, is also perfectly clear to the COCOM committee which--as is well known--decides, as the common will of the developed capitalist countries, what tools and equipment these countries cannot ship to the socialist countries. Guided by the embargo--that the socialist camp should not have access to the most developed technologies and devices which might also be used in military technology--the export of microelectronic manufacturing equipment and the materials used for manufacture is restricted even more than the export of the parts themselves, for it is easier to distinguish the applications areas for the latter than for the former.

The COCOM regards a product or technology as worthy of embargo as long as it is not convinced that the socialist camp--primarily the Soviet Union--is capable of producing or using it itself.

All this had to be said in advance because actually the technology embargo itself was the invisible chief player at the Elektronmas '86 international electronics machine exhibit held in Moscow in the recent past. The COCOM put the exhibitors in a peculiar, ambiguous position; they had to compete with each other and for the good-will of the customers while not being able to show their best. In part this even limited the circle of exhibitors, for the peak technology elite of the profession, the firms producing the manufacturing equipment for integrated circuits, was almost entirely missing. If such did attend they figured primarily with their other profiles. Ten and three firms respectively from the United States and Japan, leaders in IC technology, were represented, while there were, for example, 94 from the FRG, 32 from Great Britain and 24 from Switzerland.

In addition, of the 237 firms of 18 participating countries only six were from socialist countries (one each Hungarian, GDR and Soviet and three Czechoslovak). The deputy director of the exhibit explained this diplomatically, saying that "our contacts with the manufacturers of the socialist countries are much deeper than to make it absolutely necessary for them to come to such an exhibit." In reality, however, it was much more a matter of the band "beneath" the embargo and "above" the level used industrially by the socialist countries being too broad in this area.

The majority of the Western exhibitors tried to show truly modern equipment in areas less affected by the embargo. For example, the external image of the entire exhibit was virtually ruled by the printed circuit manufacturing equipment built on great granite blocks; most of this equipment is suitable for producing printed circuits with 80 micron rasters as opposed, for example, to the at most 200-300 micron rasters manufactured in Hungary. (True, the chemicals used in the former are in part embargoed.)

There were also at the exhibit a nice number of assembly equipment items and robots which can be used in parts manufacture. Among the latter the Finnish NOKIA firm, extraordinarily active and successful on the Soviet market, exhibited the most. (The NOKIA firm even publishes its representative annual report in Russian.) The business director for the robot division of the large Finnish enterprise, Eva Suomi, said, "We have close technical-commercial contacts with two Soviet ministries--the instrument industry and the radio technology ministries. For example, we developed one robot, which we manufacture but the electronics of which are a Soviet design, jointly with the instrument industry ministry. We have been manufacturing most of our robots for many years on the basis of American Unimation licenses. And although the Soviet market has determining significance for us we certainly do not want to risk our American license contacts--so we adhere strictly to the embargo. We also have a license from Unimation on the basis of which we can sell only in the socialist countries--naturally this does not pertain to the newest embargoed designs, but we always try to manufacture for our Soviet partners unique designs at a similar level. For example, the PUMA 5 model robot was embargoed because of the program language used; so we developed a version which can be programmed in a language used with Soviet microprocessors. We can sell this to the Soviet Union without restriction."

The Balzers firm, with headquarters in Liechtenstein, was one of the few firms which also showed something from the IC technologies. According to Lukas Sigrist, export manager for the firm on the Soviet market, the embargo leaves some room for export to the socialist countries even in the area of thin film technology. "Very much depends on what combination the various items figure in," said Sigrist. (It is not by chance that at the entire exhibit one could hardly see complete manufacturing lines; they exhibited the technological equipment as separate items.) "We are offering primarily universal vacuum technology equipment--which could also be used in chip manufacture," the Balzers representative continued. "At the time we shipped such equipment for the chip factory of the Hungarian Microelectronics Enterprise, which burned down in the spring. Now also, within the frameworks of business common sense, we are doing everything to help them. All this does not mean that we do not

adhere strictly to the prescriptions of the embargo, if only because one of our factories is in the United States. But even so it is possible for us to have a place in areas truly not of second rank, like compact disk technology; we sell complete manufacturing lines, largely our own development, in the socialist countries."

Some smaller firms--primarily trading firms--have gone even further in seeking gaps in the embargo. For example one Swiss enterprise asked for a special permit from its government to exhibit at Elektronmas '86 an IC wiring machine which, otherwise, is embargoed. The other unique feature of the ambiguous behavior mentioned earlier is just that it is a fundamental interest of the Western technology exporters striving for socialist markets to get the products manufactured by them off the embargo list as soon as possible, that is, to prove that the Soviet Union and its allies have already developed the given technology themselves. (It is not by chance that in general one can find, behind those articles which appear from time to time in the Western press trying to prove that the Soviet Union approximates American peak technologies much better than is generally imagined, some large American computer company intending to break into the Soviet market.)

Finally, it is worth noting that the embargo causes no headaches for those affected by it. "We recognize no sort of embargo," said V. Mamayev, representative of the Technopromimport foreign trade association. "This theme does not exist for us."

In addition, the Elektronmas '86 exhibit was held a few weeks after reports appeared in the Soviet press about a radical reorganization of foreign trade and an increase in the independence of manufacturers. So far the exhibitors have experienced nothing of this. They continued to have to conduct serious technical discussions with representatives of the ministries, and had to harmonize prices with the foreign trade associations. Many times the users themselves are not in the picture. "In general we do not know to which factory our vacuum technology equipment is going," said the Balzers representative. "We inquire about it only if the embargo authorities ask us for a report on it." In addition, the users are the responsible parties only in detailed technical questions. "All we have felt from the wind of renewal in Soviet foreign trade is that our partners have become little uncertain."

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SOVIETS BUY PRINTED CIRCUIT EQUIPMENT HELD OBSOLETE IN HUNGARY

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 9

[Text] "We are small figures in this area compared to the firms exhibiting here," said the representative of Metrimpex, the only Hungarian exibitor at Elektronmas '86, with a modesty worthy of respect. At the stand of the firm they exhibited the graphic digitizing tablets of the Fokgyem cooperative and printed circuit manufacturing equipment--consisting of a metal trough fitted with an instrument panel--of the Cegled Iron Industry Electric Instrument Makers' Artisan Producer's Cooperative. "However obsolete this equipment appears in this environment," said Laszlo Bakosi, technical leader of the Cegled cooperative, "there is very great interest in it. Even our domestic partners will not buy this model from us any more; it is actually suitable only for experimental manufacture. For them we manufacture one with much greater output, on the basis of a West German license. But our Soviet partners are so devoted to a manufacturing line of earlier design that they would rather set up more of them side by side than experiment with something newer. Only the quota fixed in the barter trade agreement between the two countries puts a limit on our shipments. First they reduced from the fifty of last year to two the number of manufacturing lines we could ship, and even with the supplementary quota we got in the meantime we can ship at most only 20-25 lines this year."

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HUNGARY: DEVELOPMENT OF TPA COMPUTER FAMILY TRACED

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 15

[Article by Geza Lorincze: "Stored Program Data Processing." The Hungarian abbreviation for "Stored Program Data-processing" (Tarolt Programu Adatfeldolgozas) is TPA, the name of the computer family.]

[Text] The 16 bit TPA story began at the beginning of the 1970's with the TPA-70 small computer. This was an independent development from the viewpoint of both hardware and software. The SZTAKI [Computer Technology and Automation Research Institute] connected a magnetic disk and a graphics terminal to the computer. Among the many interesting events connected with the TPA-70 perhaps the most exciting for a developmental engineer was the evaluation work done at the American Control Data Corporation.

The first member of the TPA-11 family, the TPA-11/40, appeared about 10 years ago. Its microprogrammed central unit, made up primarily of low integration circuit elements, provided PDP-11 compatibility. The large number of domestic applications proved that computer technology here at home could not escape from the world-wide attraction of the PDP-11. But the joy of experts working in the environment of the FOBOS and DOS-RV operating systems soon began to be overshadowed by the limited memory size. User demands developed very quickly and at the very beginning of the 1980's it became obvious that a further development of the TPA-11/40 was needed.

It was regarded as an indispensable requirement of the further development that the future members of the TPA-11 family, which debuted with the TPA-11/40, should be completely compatible from above with the TPA-11/40, making it possible to run the already developed user programs without modification. The most essential technical criterion for advancement was increasing the critical systems level power in a multi-user environment. Extending the 256 K byte operational memory size of the TPA-11/40 seemed the most logical first step. In a very short time from intention to realization the TPA-11/48 appeared in 1982; with 4 M bytes maximum memory and a microprocessor console subsystem it represented a definite milestone in the history of the TPA-11 family. The large memory size and the instruction/data area which had been introduced made it possible to use DOS-RV PLUS, thus significantly improving possibilities for multi-workstation tasks and applications. An important factor in the development was that the TPA-11/40 users should be able to

convert their systems into a TPA-11/48 with relatively little material expenditure. The uniform interface surface characterizing the TPA-11 family--the UBUS--ensured and still ensures the saving of the peripheral assortment and the possibility of further development in small steps. The large number of conversions from the 40 to the 48 and applications based on the TPA-11/48 proved the correctness of such a quickly realized alternative for further development.

A longer range developmental program for an independent system architecture in another branch of the TPA-11 family began 5 years ago. The backbone of the architecture is a 32 bit (expandable to 64 bits with little modification), 10 M bytes per second throughput, synchronous controlled internal system bus; in designing this we also regarded it as fundamental that it should be possible to go above the 32 bit processors without a hitch. The first product of this developmental line, the TPA-11/440, appeared on the market in 1984. With its expanded instruction set (floating point processor and decimal arithmetic), a DOS-RV PLUS operating system handling 4 M bytes of memory, an LSI element base and easily expandable modular design it offers a broader spectrum of applications possibilities. The 32 bit output and input architecture is especially advantageous in a multi-user environment. It is a unique property in the PDP-11 family also that an optional, second (expansion) UBUS adapter can be connected to the computer, improving the output and input capacity of the system. Use of the second bus adapter is completely transparent from the viewpoint of software.

The VLSI J11 microprocessor, which had a great effect on the PDP-11 line of DEC, also served to refresh the TPA-11 family. The architecture development which began with the TPA-11/440 profited from this very quickly; the TPA-11/420 grew almost unnoticed out of the 440. The system architectures of the two models, which are very close in power, completely coincide; the memory modules and the UBUS adapters are the same; this greatly aided the continuity of manufacture. Essentially the TPA-11/420 is a 440 with a modernized central unit, without decimal arithmetic (CIS). The expandable output and input structure is also characteristic of the 420; operation of an expansion UBUS adapter is again possible.

The third member of the 400 series, the TPA-11/428, appeared recently. Its processor and memory structure coincide with that of the 420 model. The TPA-11/428 is suitable--by exchanging the central mounting box--for the functional and technological modernization of TPA-11/40 and TPA-11/48 machines in such a way that the original power unit, cabinets and peripherals can still be used. The power of the 428 processor--taking into consideration the running time of FORTRAN based benchmark programs--is two to four times that of the TPA-11/48, which does not contain the floating point option. The TPA-11/428 brings with it the larger output and input potential characteristic of the 440 and 420 models which is advantageous in a multi-user environment.

The TPA-11/170 is an analog of the 11/73 model in the MicroPDP line of DEC. It is a high powered microcomputer the peripheral subsystem of which--deviating from the other TPA-11 models--is so-called Qbus compatible. The maximum memory capacity is 4 M bytes and the operating system is typically the multi-user Micro/DOS-RV.

Even today a broad spectrum of applications can be covered by members of the TPA-11/400 series. But there are already a good number of applications which find the 16 bit virtual address range too restricted. In such cases a solution is offered by two models of the 32 bit branch of the TPA-11 family, the TPA-11/540 and the TPA-11/580.

The real novelty of the 540 and the 580 lies in the virtual memory management, which makes possible a maximum virtual address range of 2 G bytes and, in harmony with this, very large, interdependent program sizes. Their compatibility with a widely used, "industry standard" computer family makes these machines especially attractive in user circles. Both models use the UBUS bus system characteristic of the TPA-11 family to connect peripherals. The central unit of the TPA-11/540, with a modern element base, produces an acceleration of about 1.5 times compared to the TPA-11/440--for "common denominator" problems in a FORTRAN environment, not forgetting the "apples and oranges" comparisons. At the system level--depending on the application and especially the memory structure--this ratio can improve further to the advantage of the 540.

Despite its relatively more modest technological aspects (a low integration element base) the indisputably most powerful member of the TPA family today is the TPA-11/580. In regard to the capacity of its processor it surpasses the 540, which can correctly be compared with it, by about three times. The so-called open 32 bit architecture of the TPA-11/580 offers a very significant output and input potential, which represents an advantage in a multi-user applications environment--as can be well measured in response times. Naturally this is a possibility which becomes an operational reality only in the case of a suitable peripheral structure; that is, the power of a system is greatly influenced by the peripheral subsystem, in addition to the speed of the processor and the data transmission structure.

In the near future we would like to place the emphasis on systems built with very high integration processor elements. A further developed version of the system architecture characteristic of the TPA-11/400 series was evolved recently; it makes possible block mode transmission of 64 bit data. The functionally improved bus system, with a throughput capacity of several tens of M bytes per second, will be suitable for parallel operation, with so-called tightly connected, common memories, of more than one processor. Although the architecture is essentially processor independent the most important tasks of the near future include development of multi-processor systems which are program compatible with the TPA-11/500 computers.

The TPA Computer Family

Characteristic	11/40	11/48	11/170	11/440	11/420	11/428	11/540	11/580
Virtual address length (bits)	16	16	16	16	16	16	32	32
Max. physical memory (bytes)	256K	4M	4M	4M	4M	4M	15M	8M
Cache memory	option	option	8K	16K	16K	16K	no	8K
Special instructions	--	--	--	CIS	--	--	FPA	FPA
Memory data width (bits)	16	16	16	32	32	32	32	32
Memory data protection	parity	parity	ECC	ECC	ECC	ECC	ECC	ECC
Memory and peripheral bus systems	UBUS	MEMBUS UBUS	QBUS	Xbus 2xUBUS	Xbus 2xUBUS	Xbus 2xUBUS	Memory bus UBUS	SBI 4xMASBUS 4xUBUS
Output/input throughput (Mbytes/s)	1.7	1.7 1.7	2.5	10 2x1.7	10 2x1.7	10 2x1.7	8 1.7	13.3 4x2.2 4x1.7

CIS=commercial instruction set; FPA=floating point accelerator; ECC=error correcting code.

[Figure 1, published with the article, shows the family tree of the TPA family; Figure 2 is a performance diagram of the TPA family--the vertical axis is the relative output/input power and the horizontal axis is the relative processor power.]

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SOCIALIST MARKET FOR HOME, SCHOOL COMPUTERS

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[Article by Peter Broczko: "The Socialist Market; Home and School Computers"]

[Text] Today one can get home computers in the West for 50-200 dollars and in our country for 5,000-65,000 forints, without peripherals. Because of their low speed, small operational memory and limited peripheral supply they are generally useful only for education, games or solving tasks which come up in housekeeping.

In the beginning the idea of home computers was closely linked with amateur computer building. In the development of microelectronics the Intel 8080 microprocessor which appeared at the beginning of 1974 was the first perfected type to excite the interest of amateurs. They quickly connected it to bits of memory and other elements and created the first microcomputers. The first device which was flexible enough to be regarded as a personal computer appeared commercially in January 1975. This was developed by the MITS firm in the United States and was called the Altair 8800. The basic system was sold in a bag (primarily for amateurs) for 395 dollars, and assembled for 621 dollars. At the time the cheapest minicomputer could be obtained at a price around 6,000 dollars.

While his friends built on the Altair foundations, Steve Jobs, then hardly 20 years old, thought out a new philosophy; he had as his goal the development of a simply managed system, "all you have to do is plug it in," which could be used even by people with no computer training. This idea gave birth to the Apple I in 1975; the first Apple II, a perfected version of it, was delivered to a customer in May 1977. This model started the microcomputer (and home computer) landslide.

But the price of the Apple II was too stiff even for Western European wallets. This was recognized by the Englishman Clive Sinclair, and in November 1981 he put on the market in England the cheap ZX81, and exactly a year later the ZX Spectrum. Together with the Commodore-64, which also appeared in 1982, these two models made the concept of home computers well known in Europe virtually within months.

The first home computer of the socialist countries was not long in coming; the Aircomp-16 was shown in Budapest in December 1982. This was followed by a long pause then, at the end of 1983 and especially in 1984, socialist made home computer models began to appear in larger numbers. In the spring of 1985 there was a qualitative step forward in that a socialist made home computer appeared in retail trade for the first time in the socialist countries; again this happened in Budapest, and the computer was the Primo.

It must be noted that the concept of home computer outlined in our introduction has now become obsolete in the developed countries. Even in 1984 the typical "home computer" was characterized by a 16 bit processor, 1 M byte floppy disk storage, etc. The first home computer of IBM, announced in 1986, is a good example of this. In this article, however, we will use the concept of home computer in its classical sense, circa 1982. In the following we will review country by country the manufacture of home computers, the development of the supply of home computers, and the present situation.

Bulgaria

They recognized the significance of microcomputers very quickly here and the first model, the IMKO-2 intended as a school computer, appeared in 1982. It contained a Rockwell 6502 microprocessor, close to the Motorola 6800 microprocessor which was then beginning to be manufactured by the Bulgarian microelectronics industry, and was compatible with the Apple II. The IMKO-2 was developed in the Computer Technology and Robotics Institute of the Bulgarian Academy of Sciences and as a manufacturing base for it they began to build a computer factory in Pravec, the birthplace of Todor Zhivkov. Afterwards the machine appeared in the schools as the Pravec-82.

The Pravec-82, however, was in itself an expensive machine, although the schools had to pay only a part of the production cost, a total of 4,760 leva. The situation was further complicated by the need for floppy disk storage, domestic manufacture of which could begin only in 1986, so this significantly increased the capitalist import fraction of the configuration. And although the Pravec-82 has outstanding color possibilities they used only black-white TV sets in the schools and even in 1986 color TV was among the shortage items. Because of these difficulties they developed a unique school computer program; they created computer rooms in the trade secondary schools, in which they put 20-30 machines. By 1985 they had connected these into a local network, so the teacher could check the work of any student from his desk at any time.

Manufacture of the Pravec-82 was stopped at the beginning of 1986 after making about 5,000 units. This was to be expected for in the fall of 1984 they introduced new types, the Pravec 8B and Pravec 8M. The Pravec 8B has a separate, movable keyboard and two built-in floppy disk drives; the keyboard is built in with the central unit for the Pravec 8M, and the floppy disk drives constitute a separate unit.

Finally, by 1986, the Pravec 8B disappeared and manufacture of the Pravec 8A and Pravec 8M began. The Pravec 8A is made of more highly integrated elements and its operational memory can be expanded to 1 M byte. With its Apple II compatibility the Pravec 8M provides CP/M compatibility too; its price is

about 2,000 leva. In the future also only public institutions will have access to these machines.

The first Bulgarian made home computer, the Pravec 8D, appeared in the fall of 1984. It is compatible with the English made Oric-2. The basic version has 16 K operating memory with a BASIC interpreter in ROM. The Z-80 assembler compiler and FORTRAN, Pascal and PILOT compilers can be read in from an ordinary cassette tape recorder. It should be connected to a color TV because color handling and screen resolution are very good. In the meantime manufacture of the prototype Oric-2 has ceased, but they continue to make the Pravec 8D in Bulgaria. The 1986 plan prescribed manufacture of 500 units and the total made thus far is still under 1,000. The price of the Pravec 8D is now 420 leva, but this is only a theoretical price; in practice they can hardly be purchased. They were obtainable in the shops, being sold in radio-television shops.

Despite these efforts few children have access to a computer in Bulgaria. A home computer continues to be a rare thing and many of the schools still do not have a computer.

Czechoslovakia

At the beginning of the 1980's they made several types of educational microcomputers in Czechoslovakia; their common characteristic was a hexadecimal keyboard, so communication with the machine was at the machine code level. For example, these types included the TEMS 32 which appeared in 1980 and the PMI 80 which appeared in 1982. We might mention as a matter of interest that our country imported a small number of the latter for industrial purposes.

The first Czechoslovak made true, friendly home computer was developed by the computer factory in Novy Bor at the end of 1983 and introduced as the IQ 150. The next year they manufactured 500 of these, with the further developed designation IQ 151; in 1985 they made 1,500 of them and in 1986, the last year of manufacture, they made 2,500. The IQ 151 had an equivalent of the Intel 8080 made in Czechoslovakia under the name MHB 8080. The initial price of the IQ 151 was 20,000 crowns and in 1986 they still delivered them for 15,000, in practice only to public institutions.

Additional home computer types appeared 3 years ago. Tesla introduced the PMD 85, compatible with the HP 85. Series manufacture of this began in 1985 and so far they have made about 4,000 of them. The price was 14,500 crowns in 1985 and 11,000 crowns in 1986.

The VUVT in Zilina appeared with two home computers at once in 1984. The price of the smaller 32 K byte SMEP PP 01 was initially 14,800 crowns and that of the 64 K byte SMEP PP 02 was 50,000 crowns. These were made in smaller quantities and the few hundred units were delivered primarily to educational institutions.

For the time being a central school computer program has not been organized in Czechoslovakia. Home computers are rare, because those of domestic manufacture have not yet reached retail trade and the influx of Western machines through tourists is very small.

Poland

The first Polish home computer, the Meritum, was shown at the Leipzig fair in 1984. But the TRS-80 compatible machine was too expensive to spread on a mass scale.

At the same time they began to authorize creation of the Polonia enterprises. These are mixed enterprises created jointly with Poles living in the West in which the Western partner takes care of parts and the partner in Poland provides the manpower for assembly and the market. Assembly of ZX81's began this way in 1984 and of the ZX Spectrums in 1985.

Two years ago the Ministry of Education and Science announced a school computer competition. The first point of the requirements system published was that the competing machine must be compatible with the ZX Spectrum already widespread in Poland. The other requirements included the need for a parts base of socialist manufacture, the possibility of linking into local networks, an ability to set up classrooms, good construction, a maximum price of 100,000 zlotys and a capacity to manufacture 100,000 units per year.

The competition was won by the ELWRO 8000 Junior, which led to ending preparations for manufacture of the ELWRO 700 home computer introduced in 1985. The Junior is not only compatible with the Spectrum, the CP/M operating system also runs on it. The new school computer was shown publicly at the Poznan fair in the summer of 1986 and figured abroad for the first time at Orgtechnik '86 in Budapest.

The Polish school computer program should receive an impetus with the appearance of the Junior. In addition there are relatively many microcomputers in the country brought in by Western tourists. The import of developed technology is supported at the state level, as the nominal duty is based on the weight of the microcomputer.

Hungary

The first home computer of the socialist countries, the Aircomp-16, was introduced in December 1982 at the INTERKOMPUTO exhibit in Budapest. This was made by the Lukacs brother and sister, gymnazium and university students, from the Homelab, with a license purchase. The first price of the machine was 27,000 forints, reduced to 19,900 forints in 1983. Several hundred of them have been made since. They can still be obtained; the price with three high performance software items is 29,000 forints. (The prototype Homelab still lives, constantly modernized; indeed, since 1986 it has been available in the shops.)

The first school computer of our country was the HT-1080Z, which won the school computer competition of the Science Organization and Informatics Institute. Since September 1983 at least one of them has gone into every secondary school in the country. This last fact is very important. So far not

a single socialist country has realized such a bold program, and the four year "historic" perspective proves the success of the pioneering initiative. As a matter of interest it should be mentioned that they made more machines than there are secondary schools in the country. The surplus went to those schools whose students placed in various secondary school programming contests. They made almost 4,000 of them, so this type became the first machine of the socialist countries made in a series of over 1,000.

Another home computer novelty in 1983 was the Mickey-80 developed by the LSI ATSZ. Most of them were purchased by public institutions.

The Primo appeared 3 years ago. Relatively cheap and sold in the shops it was to create the category of domestically made home computers. The goal was achieved and in the first year of its manufacture it was for sale in four county seats as well as in Budapest. The Primo became the first socialist made home computer which could be obtained in the shops. Its price has been falling constantly; the 32 K byte version cost 15,000 forints in 1984, only 9,000 as of June 1986 and only 4,900 after September. The modernized Pro/Primo, which can handle color, appreared in November 1985.

The TV-Computer of Videoton was shown at the 1984 spring Budapest International Fair at the same time as the Primo but it appeared in the shops only 2 years later, in the spring of 1986. This 12,800 forint machine can now be obtained in all Centrum department stores in the country, so it is the first computer obtainable in shops in many provincial cities.

The greatest event in this category last year was announcing the results of the second domestic school computer competition. Only one type was selected then, which gave a monopoly status to the manufacturer, with all the advantages and disadvantages of that. Now there are three each winners in two categories, and the schools can choose freely among these types. The favorable effects of the developing price competition, favorable for consumers, that is the schools, can be felt already (e.g., the drop in Primo prices and the national sale of the TV-Computer).

The Brailab, made for blind people, belongs in this performance category. The letters typed in are immediately spoken aloud, synthesized by the computer. In the first year 23 of these computers, which appeared in 1986, were distributed to state institutions for the blind. As the name indicates the machine was developed from the Homelab machines of the Lukacs'es; the voice synthesizing part was developed at the MTA KFKI [Central Physics Research Institute of the Hungarian Academy of Sciences].

Home and school computers of domestic manufacture make up only a fraction of the machines in this category operating in the country. (According to estimates the number of home and school computers operating in the country at the end of 1986 exceeded 100,000; only about 10 percent of these are of domestic manufacture.) The overwhelming majority of the home computers operating in the country arrived in Western tourist trade. According to expert estimates these include over 20,000 Commodore-64's and nearly 20,000 Spectrums. The other Western types in order of number of units here are the

Commodore-16, ZX81, Commodore Plus 4, Commodore VIC-20, Commodore-116 and Commodore-128.

The Commodore-16, as one of the winners in the school computer competition, spread in the schools very quickly, but since manufacture of it has ceased the schools are now buying Commodore Plus 4's instead.

Although the wave of domestic popularity for home computers peaked in 1985 their number continues to increase very significantly. In 1986 the price of school computers, for schools, fell to an attainable sum of about 10,000 forints; for this reason, among others, the number of machines acquired by schools jumped. So as a result of the moderately declining acquisition of home computers and the vigorously increasing rate of school computer acquisition the number of machines in this category can be expected to increase year by year in our country until 1990.

GDR

Three years ago the domestic sensations at the spring Leipzig fair were the first two GDR made microcomputers, the HC 900 made in Mulhausen and the Z 9001 developed by Robotron. Both can be compared--in regard to their power--to the Sinclair Spectrum. The HC 900 is smaller, with a maximum operational memory of only 16 K bytes, while its larger brother can be expanded to 64 K bytes in units of 16 K bytes. There are 58 moving keys on the keyboard of the Z 9001. Character display is in 24 lines with 20 or 40 characters per line. The graphic resolution is very good, 320 x 256 pixels, and the machine can display these in 24 colors on an ordinary household TV. A household tape recorder can be connected to it as a peripheral. It also has a 5 octave sound generator. An interpreter version of the BASIC translator is in read only memory.

While manufacture of the Z 9001 continues today the HC 900 has been replaced by the KC 85. This also contains a V.24 interface. Certain changes were made in the CAOS operating system and they also sell a 48 K byte operational memory module for it. This makes possible use of a BASIC interpreter which completely replaces the CAOS system. The KC 85 is being made in two places.

They have not yet started a school computer program in the GDR, but in 1985 the schools were supplied centrally with electronic calculators. One can also get the GDR made home computers individually. In addition, Western machines are coming in in tourist traffic, primarily from relatives living abroad. The machines are extraordinarily popular; a microcomputer club movement started in 1985.

Romania

As for the GDR the first home computer types appeared in Romania in 1984, the CA 109 and the HC-80. The CA 109 is based on the 8 bit Intel 8080 microprocessor most often used in Romania and can be programmed in the BASIC language. The CCAB makes it in a very small series.

The HC-80 is of greater significance, not only because it is compatible with the ZX81 but also because the country's largest computer factory, the ICE Felix, has started manufacture of it in monthly series of hundreds. This same

factory made a model change in 1985 and began to manufacture an equivalent of the ZX Spectrum under the name HC 85.

The machines made are shipped primarily to secondary schools and culture houses, but it is a rare school that has a computer. The concept of home computer is still virtually unknown in Romania.

Soviet Union

For a long time the cause of home computers was neglected in the Soviet Union. The first model, the Agat, was described in detail in the November 1984 issue--illustrated only with stylized drawings--of the popular journal Science and Life, published in 3 million copies. This machine is compatible with the Apple II, and in the final analysis there is a repetition here of the difficulties already noted for Bulgaria. Of these the most serious is the lack of floppy disk stores. At the end of 1985 they began manufacture of this type simply and shipped many machines to the schools without any sort of background storage. Unfortunately the children then soon got tired of the "tap-tap-tap" with these.

Three other types also appeared in 1984 and in price they are close to home computers. The Svetlana Association in Leningrad appeared with the Elektronika DZ 28, the Elektronika BK 0010 out of Moscow and the VEF Mikro 1021 from the famous Riga electronics factory.

At present the BK 0010 is being made in the largest series. One can get them in the shops, after subscribing in advance, for 450 rubles. The three types have very similar specifications; their microelectronic base is the equivalent of the Intel 8080 made in the Soviet Union under the name KR5801K80A. There are two versions of the first two, 16 and 32 K byte versions, while the VEF is made in versions with 16 and 64 K bytes operational memory. They attach household cassette tape recorders to them as peripherals. All three machines can be programmed in the BASIC language.

Year before last, after announcement of the acceleration program, they judged the cause of school and home computers quite differently. They surveyed the domestic manufacturing capacity and last year Elektronorgtechnika announced international competitive bidding to make up the missing capacity. The Sinclair ZX Spectrum participated in this with good chances (unfortunately it turned out later that this victory could have been the last hope of the firm before it went under). The winning machine--as a great surprise--was the Yamaha Japanese home computer. According to the reports the Japanese delivered the 8 bit machine with screen, floppy disk store and printer for 314 dollars. It increased the interest of the deal that the MSX (Microsoft Extended Basic) operating system, developed by the American Microsoft firm and offered in the interest of creating complete compabitility among various types, will run on the machines. According to the reports the Japanese Nippon Gakki firm delivered 4,000 Yamaha computers to the Soviet Union in 1986. The effect of these is being felt already; they are being used intensively in Moscow schools and research institutes.

The concept of home computer is still very new in the Soviet Union. Although Soviet and Western made home computers can be found in the country and a club movement is forming, all this is still palpably in the initial phase.

Socialist Countries Outside of Europe

Of the distant socialist countries China is far in the lead in the area of home computers. According to official sources there are now 23 enterprises producing home computers in China. The number manufactured in 1985 was 150,000 and they prescribed production of 200,000 in 1986. At present they produce two types of home computer. In 1985 their price was over 100 [as published] yuan; now, according to official sources, it has fallen to around 300 yuan (one yuan equals about 13 forints, but the average pay is only 80-100 yuan). The school computer program began with the special curriculum schools; today there is at least one microcomputer in each such school. Microcomputers are spreading quickly in the large city schools too; e.g., 80-90 percent of the Peking schools already have school computers. But in the provinces and smaller settlements a microcomputer is still a rare phenomenon. On the streets of the large cities, in the displays of the already common microcomputer shops, they offer primarily IBM PC compatible Chinese made machines in the professional category. The few home computers in the shops in 1986 were Japanese made, MSX standard machines, at a price of 800 yuan.

The home computer is an unknown concept in the other socialist countries outside Europe. The school computer cause also got started only in 1986, with Bulgarian aid. They offered ten each Pravec 82 computers to North Korea, Cuba, Mongolia and Vietnam. The offer was made by the Dimitrov Komsomol through the youth organizations of the several countries, and they sent one instructor to each of the countries with the machines delivered to get over the initial difficulties. They are not only helping start up the machines but also are participating actively in developing the entire social program, for example in developing professional literature in the national language.

This offer is also the largest delivery abroad of home computers ever undertaken by a socialist country. Export volume manufacture has developed in our country (the Primo), but despite intensive foreign market work we have not succeeded in exporting them.

Unfortunately standardization has not developed among the socialist countries in the area of home computers; indeed, as appears from what has been said, there is not even a uniform line. A role is certainly played in this by the fact that--in the final analysis--home computers are not tools of production but rather belong in the sphere of entertainment electronics. Thus their import and manufacture, the effect of supplying the populace with home computers, cannot be measured with direct indexes. The contribution of home computers to the spread of the computer technology culture, making it a mass phenomenon, is of inestimable significance, however, in regard to the future. It is a sad fact that so far this has been recognized in only one or two socialist countries. All this is resulting in a backwardness which it will be increasingly difficult to make up.

Home and School Computers of the European Socialist Countries

Country	Model	Manu. Firm	Micro-processor	RAM/ROM (K bytes)	Proto-type	Notes	Year
Bulgaria	Balik	Izot, Sofia	SZM 601	64/16	—	Kinderg.	1985
	IMKO-2	Robotics Inst., Sofia	(Motorola 6800) Rockwell 6502	64/8	Apple II	School prototype	1982
	IMKO-3	Robotics Inst.	Rockwell 6502	64/8	Apple II	School prototype	1984
	Pravec 82	Pravec computer factory	Rockwell 6502	64/8	Apple II	School series	1982
	Pravec 8A	Pravec computer factory	Rockwell 6502	64-1024/ 16	Apple II	New school computer	1986
	Pravec 8B	Pravec computer factory	Rockwell 6502	64/8	Apple II	School	1984
	Pravec 8D	Pravec computer factory	U 880 (Z80)	16/8	Oric-2	Home	1984
	Pravec 8M	Pravec computer factory	Rockwell 6502 and Z80	64-1024/ 16	Apple II	CP/M compatible	1984
Czecho-slovakia	IQ 150	ZPA, Novy Bar	MHB 8080	16/8	—	School	1983
	IQ 151	ZPA	MHB 8080	32-64/8	—	School	1984
	PMD 85	Tesla, Piestany	MHB 8080	48/12	HP-85	School	1984
	SMEP PP 01	VUVT, Zilina	MHB 8080	32/8	—	School	1984
	SMEP PP 02	VUVT	MNB 8080	40-64/8	—	School	1984
Poland	ELWRO 700	ELWRO, Wroclaw	U 880 (Z80)	16-48/ 8-16	—	School	1985
	ELWRO 800 Junior	ELWRO	U 880	64/16	Spectrum	CP/M compatible	1986
	Meritum	MERA-ELZAB Zabrze	U 880	18/12	TRS-80-1	School	1984
	ZX81-Polski	Ameprod, Warsaw	U 880	1-64/8	ZX81	Home	1984
	ZX Spectrum -Polski	Ameprod, Warsaw	U 880	48/16	Spectrum	Home	1985

Home and School Computers of the European Socialist Countries (continued)

Country	Model	Manu. Firm	Micro-processor	RAM/ROM (K bytes)	Proto-type	Notes	Year
Hungary	Aircomp-16	Boscoop	U 880 (Z80)	16/8	--	Home	1982
	Aircomp-32	Boscoop	U 880	32/8	--	Home and school	1983
	Homelab 2	Homelab Gmk	Z80	16/8	--	Home	1983
	Homelab 4	Color Coop, Dombovar	Z80	16-64/16	--	Home	1985
	HT-1080 Z	HTSZ	U 880	36-64/16	TRS-80-1	School	1983
	HT-3080 C	HTSZ	U 880	64/16	TRS-80-1	School	1986
	IPT-002	Triton sm. coop	U 880	16-64/8	--	Home	1984
	Mickey	LSI ATSZ	U 880	16-32/8	--	Home	1983
	Primo	Microkey	U 880	32-64/16	--	Home	1984
	Pro/Primo	Microkey	U 880	32-64/16	--	Home	1985
	TV-Computer	Videoton	U 880	32-64/16	--	Home and school	1984
GDR	HC 900	Micro-electronic, Mulhausen	U 880	32/8	--	Home	1984
	KC 85/1	Micro-electronic	U 880	32-64/16	--	Home	1985
	KC 85/2	Robotron	U 880	32-64/16	--	Home	1986
	Z 9001	Robotron	U 880	16/12	--	Home	1984
Romania	CA 109	CCAB	8080	16/8	--	Public institutions only	1984
	HC 80	ICE Felix, Bucharest	U 880	1-64/8	ZX81	"	1984
	HC 85	ICE Felix	U 880	16-48/16	Spectrum	"	1985
Soviet Union	Agat	--	K588V52+ KV88VU2	64	Apple II	School	1984
	Elektronika BK 0010	Moscow	KR5801K80A	16-32/8	--	Home	1984
	Elektronika DZ 28	Svetlana	KR5801K80A	16-32/8	--	Home	1984
	VEF Mikro 1221	Ienin-grad	KR5801K80A	16-64/8	--	Home	1984

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IBM, VICTOR, HUNGARIAN ASSEMBLED FAR EASTERN PC'S COMPARED

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 2, 28 Jan 87 p 26

[Article by Imre Szalai: "PC's On The Scale"]

[Text] We are already used to seeing the results obtained by running a few benchmark programs attached to the more detailed analyses of microcomputers in foreign journals. Such collections of test programs, containing "sharpened" programs to study the processor, operational memory and input and output units, are becoming increasingly standard. My colleagues and I performed measurements essentially identical with the programs in these generally accepted packages. We studied one each of the original IBM micros, which can be regarded as the basis for comparison, and the IBM compatible Victor soon to be for sale in our country. We also ran our test programs on clones of Far Eastern origin which are on the market with the trademark of small cooperatives in Hungary. In these latter cases we did the tests at the site of the small cooperatives on configurations they had assembled and with their permission.

Description of the Test Programs
(Source lists can be found in our editorial offices.)

BM1: A program performing four basic operations 5,000 times.
BM2: Sieve of Eratosthenes 5,000 times.
BM3: Serial writing of 512 records to floppy disk.
BM4: Serial reading of 512 records from floppy disk.
BM5: Serial writing of 512 records to hard disk.
BM6: Serial reading of 512 records from hard disk.

We also did the measurements with the aid of various BASIC interpreters--where this was possible--to filter out deviations arising from the efficiency or less fortunate solutions of realizing the interpreter. This filtering did not produce significant differences. It is interesting compatibility information, however, that the BASICA interpreter of the IBM PC/XT, which also contains ROM routines, ran only on the MXT, in addition to the original XT. The number lines form a consequent system in themselves; the results obtained can be interpreted.

The tables include--with the several machine types--the magnitude of the clock signal frequency; the clock signal frequency ratios must be taken into consideration especially when comparing the BM1 and BM2 results. For these two test programs the results of the VPC II are best among the machines compatible with the IBM PC/XT. To a certain extent this can be attributed to the 8086 processor of the VPC II. But the cause is basically the newer, better design, for the BM1 and BM2 test results of the Apricot F10, which also has an 8086 processor, are 62 and 146 seconds respectively.

The performance of the floppy disk drive units is the same on most of the machines tested (on the basis of the BM3 and BM4). The results of the IBM PC/XT floppy disk differ significantly from this uniform picture. In the case of the IBM PC/AT the difference in the write and read to floppy disk data deviate from the average by an order of magnitude. The cause of this certainly lies in the more secure, checked write strategy.

From the viewpoint of speed and the speed differences between writing and reading there is a wide spread in the hard disk test results (BM5 and BM6). Here the field is divided by many types, quality, access time and check method. In this group the results of the Instrument Technology machines are very good. It is striking that on the MXT and MAT the write speed (BM5) is greater than the read speed (BM6)--contrary to what was expected.

Finally, one more point. We ran our performance testing programs on MAT and Controll machines purchased earlier. There was a significant difference between the data measured on a configuration assembled at the site of Instrument Technology and that measured on an older identical computer. Development has been especially successful in the case of the hard disk, for the improvement measured with BM1 and BM2 can be explained by the greater clock speed. Our MC86 machines purchased earlier from the Controll Small Cooperative gave very different results in the band between data shown in the IBM PC/XT and MC86 table.

Comparison of IBM PC/XT Compatible Computers

Model	Clock Frequency (MHz)	Times in Seconds BM1	BM2	BM3	BM4	BM5	BM6	Average
IBM PC/XT	4.77	69	146	55	52	42	29	65.5
Victor VPC II	4.77	41	95	30	29	21	20	39.3
Controll MC86	4.77	55	130	32	29	27	26	49.8
Controll MC86 Turbo	8.00	33	79	30	29	18	15	34.0
Instrument Tech MXT	8.00	30	71	31	29	14	15	31.6
Microsystem PC-420-XT	4.77	55	130	31	29	26	26	49.5

Comparison of IBM PC/AT Compatible Computers

Model	Clock Frequency (MHz)	Times in Seconds BM1	BM2	BM3	BM4	BM5	BM6	Average
IBM PC/AT	6.0	26	58	49	26	18	11	31.3
Victor V286	6.0	21	52	27	25	13	11	26.8
Instrument Tech MAT	8.0	16	38	27	25	8	9	20.5

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SOVIET AUTOMATION PROGRAM INCENTIVE TO HUNGARIAN INDUSTRY

Budapest MAGYAR HIRLAP in Hungarian 24 Feb 87 p 5

[Interview with Laszlo Meszlenyi, Chief of the International Main Department of the Machine Tool Industry Works [SZIM], given to Erzsebet Eller in Tata banya on 24 February 1987]

[Text] The coordinating council of CEMA's GEB (Machine Industry Cooperation Committee) is starting its five days of work in Tatabanya today. In connec tion with this, we talked with Laszlo Meszlenyi, Chief of the International Main Department of the Szerszamgepipari Muvek, who is at the same time the head of the Hungarian secretariat of the Committee's Sectoral Office 2.

Next to the CEMA council session, the GEB is the highest authority in matters relating to the machinery industry. A part of the GEB is Sectoral Office 2, which coordinates between the socialist countries the development and produc tion of tools, the machine-tool industry, robot technology, and so-called flexible manufacturing systems and the application of these resources. The work is based on the CEMA complex program for the period until the year 2000.

[Question] It has been known since the last CEMA council meeting that by the turn of the millennium the Soviet Union wants to supply 80 percent of its machinery industry with this kind of computer-controlled and highly accurate automatic equipment. For this--according to our information--it would have to replace 2.5 million machine tools. What does this mean for Hungarian indus try?

[Answer] To Hungarian manufacturers of production equipment it means an extraordinarily strong motivation. This is because it is no longer possible, or at least getting less and less possible, to sell unified mechanical apparatuses, so that enterprises are forced to develop flexible manufacturing equip ment that represents a very high technological and technical level. Therefore the SZIM, the Csepel Machine Tool Factory, and the Csepel Singular Machine Factory, as well as the electronic background enterprises that supply them, have no choice but to meet the demands of this market. The Soviet Union has an enormous absorptive capacity. Thus, Hungarian plans for replacing produc tion structures must match the content of the complex program.

[Question] But development and keeping pace require money...

[Answer] Governments provide support, in accordance with their own resources and their own capabilities, to those who take part in the attainment of the jointly formulated goals; but I would emphasize that these agree in many respects with our own announced central programs. And it is well known that the development sources which the enterprises create for themselves can be supplemented with various tenders designated by the OMFB (National Technical Development Committee) and the Ministry of Industry as part of the OKKFT (the national medium range research and development plan).

[Question] Supplementing them is in fact all that can be done, since 60-70 percent of development costs are paid by the enterprises themselves. But let's get back to the tasks of the GEB, or rather, to those of your secretariat within the GEB.

[Answer] We are called the International Cooperation Secretariat for Tools and the Tool Industry. The activities of the coordinating council on flexible manufacturing systems and industrial robots, which is now holding its session in Tatabanya, result in the assignment of certain tasks to Hungary, and our job is to organize these tasks. To give an account of what we do would take a long time, but perhaps it will give you some indication that the contracts for production specialization that are concluded in this field include 3,418 items. Some of them are tasks begun years ago and continuing from 1986 to 1990, but others are new. Of the hundreds of examples, I can pick out at random the international specialization of the production of forging and pressing machines, or of foundry equipment. The contracts--defining what each will develop and manufacture and what he will not--ensure a long-term stable market for Hungarian production enterprises and promote the full utilization of their capacity. But in the first area I mentioned, as it happens, only a few relatively small pressing machines, hammering machines, and sheet-metal-bending shears are being manufactured, and thus the contract is also significant from the standpoint of meeting domestic import needs.

[Question] If I understand you correctly, the purpose of the program and of the agreements and contracts concluded under it is to avoid unnecessary duplication of effort.

[Answer] The operative word is "unnecessary." After all, there are some kinds of duplication that serve the economic and production interests of nations.

[Question] Who are the ones that sign the contracts?

[Answer] Bilateral ones are signed nowadays by the enterprises concerned. Multilateral ones are signed on the Hungarian side by the managing directors of the SZIM and the Csepel enterprises, but the Soviet Union has been represented up to now by the ministries.

[Question] We read news reports every day about the Soviet reform. Can it bring something new in this field as well?

[Answer] Of course. But we expect progress in other respects too. Among other things, the Hungarian representatives in CEMA are urging that the coordination of planning should be continuous instead of being done five years in advance. We and the Soviet Union are pursuing the common goal of setting up direct contacts between enterprises...

[Question] But this last-mentioned item is something for which there already is a precedent, even if not in the machinery industry. It's well known that the first Soviet-Hungarian joint enterprise was set up in the manufacture of medical instruments.

[Answer] The SZIM has also taken an initiative in favor of direct inter-enterprise cooperation, and so have a number of other firms, of course. We really have taken the first steps.

[Question] And what is on the present agenda of the coordinating council?

[Answer] For one thing, members will be able to receive reports from the labor organs of CEMA concerning how many apparatuses have been developed, or are already in serial production, and where. This will be followed by a consideration of the results achieved by the host country. We've organized plant visits to the SZIM's Esztergom factory and to Csepel, and at the Recard factory in Gyor and the Ganz Danubius factory our guests are going to view the operation of a computerized production and control system.

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HUNGARY: FACTORY TO CONCENTRATE ON COMPUTER CONTROLLED ELECTRONICS

Budapest MERES ES AUTOMATIKA in Hungarian No 11, 1986 pp 417-421

[Article by Janos Goz, technical director of the EMG (Electronic Measuring Instruments Factory: "Chief Aspects of Enterprise Strategy." The first paragraph is the Hungarian language summary.]

[Text] The article discusses the concept and importance of enterprise strategy. It evaluates the decisions of the Electronic Measuring Instruments Factory in connection with its strategy and mentions the chief activity lines decided on for the Seventh 5-Year Plan.

The concept of enterprise strategy got established in Hungary about two decades ago.

Among the important motives for its spread and popularity we might mention the strengthening of the legal and economic elements of enterprise independence, the enrichment of corporate leadership and decision forms competent in strategic questions and, last but not least, the need to develop profitable efficiency and competitive products and organizations.

By enterprise strategy I mean determining for the longer range the activity sphere, the system of ends and means and principles of behavior--including business policy, which the literature refers to separately as marketing strategy.

Strategy is not the sum of operational activities and operational activity is not a breakdown of strategy, rather it is a predetermined guiding principle. Correct leadership style is keeping the strategy constantly in view, if necessary correcting it in everyday practice, so determining the strategy is one of the most important tasks in the life of an enterprise.

Determining the operational sphere, the activity of the enterprise, is the backbone of strategy. Selecting this is especially important when increasing productivity, the ability to produce income, is a vital question for an enterprise and a constraining economic requirement.

On this basis I will describe and evaluate the decisions made in the recent past regarding the operational sphere--and strategy--of the EMG.

In the course of preparing the Sixth 5-Year Plan we studied the place and role of the enterprise in the national economy, and the resources available. We established that the chief goal should be a further development and transformation of the product structure, in such a way that this should ensure an increase in the production and sales volume with a decreasing import content and personnel while increasing the efficiency of enterprise management and its ability to produce income, thus contributing to improving the national economic balance.

The situation analysis was also accompanied by the conclusion that a very large and highly trained intellectual capacity was concentrated at the enterprise. We established that this intellectual capacity was suitable not only for manufacture of functional measuring instruments in the traditional sense but also for the production of measurement systems, for assuming a more complicated electronic profile. The next task was to determine precisely the operational activity of the enterprise and develop the characteristic product families and developmental trends for the Sixth 5-Year Plan period.

The fundamental task of the enterprise is development and manufacture of electronic measuring instruments. As measurement technology became increasingly complex and as the need to automate measurement tasks appeared it became obvious that functional units in themselves no longer satisfied the expectations in this regard. We had to develop measurement systems suitable for highly complex measurements, primarily by increasing their intelligence. They should be controllable, capable of being automated to a certain extent and suitable, to a limited degree, for preliminary processing and recording of the measured values. The first profile trend developed in this way.

Control of the tasks listed above is possible only with a small computer suitable for this and if this is so then we should formulate as a task the goal of mechanizing the engineering work too, and in this sense we put into our profile--in a serious form--an organizational technology device category, as the second characteristic profile of the enterprise.

Finally it was decided that we must start development and manufacture of so-called industrial electronics, in part because this is a need of the national economy and in part because world trends indicated that this is the direction which will develop quickly in the period ahead. We designated two families; in one are the machine tool controls (the CNC's), and this gave the third characteristic product family. The fourth characteristic product family of the enterprise became automatic measurement devices satisfying electronic testing and manufacturing needs.

Once the operational spheres were clarified and set in order we had to survey our abilities and conditions from the viewpoint of our technologies and fixed assets which make possible not only development but also the manufacture of this equipment.

Evaluating the level of 5-6 years ago we had to establish that the technology of the enterprise was at a medium or lower level and that the enterprise technology was not suitable to permit the enterprise to manufacture CNC's and

highly complex automatic measurement equipment in a reliable, economical way. I would like to note that the thinking always included the constraining economic requirement that the productivity and ability to produce income of the enterprise had to increase, for these factors are the ones which ensure the foundations needed for operation. This was always there and played a role in selecting and determining the profile.

So our basic problem was that our ideas were in vain--we could not solve our tasks without modern technology. We reckoned with what we should strive for in the course of a technological reconstruction amidst realistic circumstances and possibilities.

The enterprise strategy formulated above is supplemented by the fact that going beyond a further development and transformation of the product structure a reconstruction of the critical technologies is also a condition for increasing the production and sales volume of the enterprise--with decreasing import content and personnel--and improving the efficiency of management and the ability to produce income.

Thanks to the OMFB [National Technical Development Committee] there were a number of studies, indeed a research and development trend had started, which posted as a goal the development of a so-called CADMAT system--that is, the development of an automated system for production, manufacture and control.

The OMFB turned significant assets to the first phase, the automation of design, within the CF 22 program, and the TAKI [Telecommunications Research Institute] was its patron. Building on the domestic computer base together with several Academy institutes--the SZTAKI [Computer Technology and Automation Research Institute] played an outstanding role here--it developed a so-called automated designing system, hereinafter referred to as the AUTER system. The OMFB announced a competition to put the AUTER system to use and provided significant material support for this. It was a vital question for our enterprise that it should participate in the program. It was successful in the competition so the AUTER system was realized at the enterprise as the first step in a CADMAT system.

We regarded the reconstruction of the manufacture of printed circuits as an important question, and the AUTER provided preparation of the master films, which is the basic technology for this, and the printed circuit drilling program tapes. So installation of the AUTER was organically linked to the next technological phase, manufacture of the printed circuits. Supplementing the manufacturing line with the necessary equipment we developed manufacture of printed circuits at an acceptable level and so settled this phase of our technological activity too.

In the next circle of questions we had to decide whether to carry out a technological reconstruction of manufacture, assembly or control. Our position was that a technological modernization of assembly was critical but the most important part of it, the soldering operation, was already automated, so it was not so urgent as the testing and control tasks, for the source of most of the losses comes from errors in or lack of very basic testing. So we said that the reconstruction of the so-called assembly technology should be postponed to

a time when the material funds for it were available, that it should not be given priority over automation of testing and control.

So we regarded automation of testing and control as the next step in the reconstruction of the technology. What sources of loss were we thinking of? For example, we had to reduce the possibility of using faulty semiconductors and integrated circuits in production, so we regarded the testing of parts, and automation of this phase of the work, as fundamental. We saw to it that the great majority of integrated circuits coming into the enterprise underwent a thorough preliminary testing before being stored. It is virtually impossible to test manually highly complex printed circuit cards containing very many parts. If we want to subject assembled printed circuits to a very thorough manual check then we must use high volume testing capacity for which there is no suitable manpower and which would take up endless time. To solve this problem, again with OMFB aid and support, it was possible for us to set up two testing devices, an in-circuit testing automat and a semi-automatic functional card tester. I feel that this concept was correct; a few figures may show how the results improved at the enterprise. During the past 5 years the per capita production value, with decreasing personnel, increased from 357,000 forints to 650,000 forints. Our goal was for the annual production of one productive worker to reach one million forints.

What did the AUTER mean to the enterprise? Topological designing which would have taken several months was reduced to 15-30 days. By mechanical means the AUTER can provide manufacture with prepared, high precision, fine raster master films, and so the fine raster, multilayer printed circuit technology could be introduced at the enterprise. The productivity of printed circuit manufacture was increased by using NC controlled drilling machines and semi-automatic screening equipment so even with greatly decreasing personnel we can today--if with difficulty--produce all our printed circuit needs, indeed we sell a part of the capacity.

In the area of testing automation, in addition to improving quality, we regularly save about 50,000 hours of testing capacity per year and can do all the high complexity testing, which is needed at the present time.

Going beyond this we must mention the fact that the experts and the enterprise leadership recognized in advance that the parts manufacturing part of the electronics industry had extraordinary technical needs and great solvent demand for automated measurement and testing equipment. This is an area which provides a possiblity not primarily for domestic parts manufacturers--although they should not be neglected either--but rather an export possibility for the needs of foreign parts manufacturers.

These thoughts inspired us to define additional developmental goals.

The national economic spread of electronics is now on the agenda. We may be putting it a little more definitely than is generally written down but on the basis of our own experiences we can and do say that if there is not a minimal technological reconstruction in the Hungarian electronics industry, which the enterprise did carry out in the past period and which it continues on the basis of useful experiences, then whatever great tasks are placed before the

electronics industry it is to be feared that the available capacity and tools will not satisfy the expectations in either quality or volume. So in the period ahead it will become absolutely necessary to have in the other enterprises working in the area a technological reconstruction of at least the size which took place at the EMG and a few other enterprises in the past 5-year plan period. So in the area of industrial electronics the enterprise is developing all that automatic testing equipment which we discussed above in connection with use at our enterprise. We have developed a flow chart for practically optional electronic equipment manufacture, testing and control, from which it can be seen that we have every phase for manufacture, or we will have equipment at various levels of intelligence and automation which we developed and manufacture ourselves. Indeed, in the longer run, this will make it possible for the enterprise to undertake the reconstruction of electronic equipment manufacturing enterprises as prime contractor from the viewpoint of testing automation.

An in-circuit tester has been developed jointly with the MIKI [Instrument Industry Research Institute]. An LSI tester suitable for testing digital integrated circuits has been developed also. Another type developed is suitable for testing analog integrated circuits. These devices can be completed with so-called "handlers" to perform mass measurements. Functional card testers, a higher speed semiconductor tester and a development system are under development at the enterprise as well. In addition the enterprise has mastered manufacture of the ICOMAT model turned over to it. We already manufacture in large numbers measurement systems suitable for functional and dynamic tests for microelectronic technology; these systems are very marketable, especially on the socialist markets. A multichannel analyzer for nuclear purposes is one of our successful systems, and we have developed a new system to cover measurement needs on it.

Naturally, as already noted in the introduction, the leadership proceeds correctly if it uses the strategic goals as guides, notes the internal-external effects and makes corrections in the interest of maintaining the economic indicators of the goal. We developed the Seventh 5-Year Plan of the enterprise on this basis; we narrowed the operational sphere of the enterprise, narrowed the product assortment to three characteristic product families, which I will describe later as development trends. So, to sum up, the conception that we had to carry out a technological reconstruction and develop a profile built on the higher intellectual capacity was successfully implemented at the enterprise during the past 5-year plan period. It can also be said that, going beyond the interests of the enterprise, the significance of the development and manufacture of technological devices goes beyond the enterprise frameworks and becomes a question at the national economic level. The medium-range technological development programs for the branch reflect this, as do the research and development programs in other directions--those coordinated by the Ministry of Industry and the OMFB.

Events have accelerated recently. On the one hand the modernization of the guidance of our economic life continually progresses; our government organs are making serious efforts in the interest of leading the Hungarian economy out of its difficult economic situation. On the other hand it can be established that the economic environment is not helping the enterprises very

much in developing and realizing their strategies. The enterprise freedom of movement has narrowed; sources, material acquisition, import and investment are restricted. The impenetrability of the guidance system, the mass of regulations, the insufficient property interest and the perversities and distortions in evaluating enterprise work are making a judgment of the enterprise uncertain; indeed, external and internal opinions judging the work of the enterprise and the leadership are becoming isolated from one another.

But if we look back and evaluate and analyze the backbone of our strategy in the present economic environment, the decisions we made from the viewpoint of setting technical development goals, it can be established, among other things, that our goals--by carrying out an intensive and successful product and technology development--proved to be a good and lasting strategy and a trend for favorable further development; indeed, they provide a product assortment for the period of the Seventh 5-Year Plan.

The picture of the developmental strategy of the enterprise would not be complete if we did not turn to the narrowed operational sphere developed in the Seventh 5-Year Plan, to the following three characteristic product families which we have decided on as the chief trends.

Electronic Measuring Instruments and Systems
In accordance with the basic profile of the enterprise the development and manufacture of electronic measuring instruments and systems will represent the basis for our future activity in the Seventh 5-Year Plan also.

With these product families we had and in part still have a significant technical-market advantage on our traditional markets; we certainly want to maintain this with further intensive development. These products, which can be manufactured in larger series, will ensure the smooth utilization of our manufacturing capacity and aid our financial and market balance.

From the market side the characteristics of the bulk of these products are CEMA bilateral and multilateral international specialization, a high technical level, and, in addition to individual use, use as functional units in automatic measurement systems for various purposes, not least of all a stable, solvent internal demand and the possibility of sales to non-ruble accounting areas, primarily to developing countries. We want to maintain this developmental principle in the future also, so it is necessary for us to have a suitable assortment of signal generators, evaluators, signal processors and controls. More concretely this means, in the area of pulse and function generators and sine generators, the development of a completely new generation of our existing instruments, which are already programmable, with automation of measurement, increasing the intelligence of the instruments and modernizing the parts. The same applies to our oscilloscopes, where our tasks are increasing the part-dependent limit frequency and development of digital oscilloscopes. We also want to maintain. and increase in-so-far as possible, our significant technical and market achievements in the logical state analyzer product family; with intensive development our goal is to increase channel number, operating frequency and services.

By developing new evaluators, system controls and peripheral units we intend to satisfhy the measurement technology needs of our users.

Our new developmental goals will satisfy the need for high intelligence measurment instruments and should continue to ensure our goals regarding their use in our own systems, which even thus far has provided significant technical and economic achievements, and regarding their similar use by customers.

Machine Tool Controls

The manufacture of machine tool controls was consolidated in the past 5 years also. Our product deliveries are smooth and acceptable to the customers; more than 2,000 HUNOR PNC controls are operating in many countries of the world. In accordance with the obligation we have undertaken we perfectly satisfy the domestic needs.

There is also a possibility to place items from this family on the non-ruble accounting market, partly on the basis of license sales, partly by realizing cooperative manufacture, and not least of all by barter or direct sales.

Our developmental goal is to satisfy the need for controls for more complicated machine tools, processing centers and manufacturing cells, with special regard to the requirements of price, service, performance and the ability to be included in hierarchic systems.

Automated Technology Devices

In this product family, as I said before, the parts manufacturers represented and represent a large solvent demand, but our signed contracts and discussions also confirm that devices developed and manufactured for equipment manufacturers also satisfy a real solvent demand. In the area of automated technology devices the goals are development of closed systems for design and testing technology, development of the missing system elements and further development according to need of the types now being introduced, production of systems operating in higher speed ranges for testing parts and fittings and standardization of system technology.

It must be noted that the development and manufacture of these will create a possibility for technology exchange and prime contracting activity for the reconstruction of electronic equipment manufacturing enterprises from the viewpoint of testing automation. Not least of all, the goals formulated for product development also satisfy that part falling on Hungary of the CEMA technical-scientific cooperation tasks set down in a government agreement.

Out of the three characteristic product families we will be able to realize a product composition which corresponds to market needs and the manufacture of which can be ensured from the expected import and the manpower which can be realistically planned on. The gross profit realized from it will cover the budgetary contacts and taxes according to present regulators, provide realistic profit shares as incentive and may cover the planned investments. There is a possibility for increasing productivity, increasing average earnings in a direction somewhat exceeding the average for our branch of industry.

In defining and carrying out our tasks we rely on the knowledge, devotion and work of our workers and developers, including the activity of the small undertakings, which have effectively aided our work thus far. Switching to the new enterprise guidance form broadened the participation of the enterprise collective in making strategic decisions, which means a further perfection of democracy and an increase in responsibility for the activity of the enterprise.

Biographic Note
Janos Goz is a graduate of the radio section of the Communications Engineering Department of the Electrical Engineering School of the Budapest Technical University. He has worked at the Electronic Measuring Instruments Factory since 1951 and since 1972 has been technical director and first deputy to the director general.

His professional activity has extended to development and manufacture of electronic equipment but primarily to the technology for it.

He is a member of the Industrial Design and Technology Council, the Automation and Computer Technology Committee of the Hungarian Academy of Sciences and the Electronics Division of the Hungarian Chamber of Commerce. He is chairman of the Ethics Committee of the Measurement Technology and Automation Scientific Association and chairman of the microelectronics and technology group working in the association.

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